

LIGHT RAIL STAFFING

A survey of light rail staffing practice, including the different types of positions and the numbers of personnel in each position at five representative U.S. light rail systems.

SCRTD Planning Department
By Steve Brye

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INTRODUCTION

This study results from a request to the Planning Department to survey Light Rail staffing practices in the United States in order to provide a basis for comparison with draft District staffing plans for the Long Beach-Los Angeles Light Rail Line. This study provides detailed staffing information on five U.S. Light Rail systems, including types of jobs and numbers of people in each position. It provides the District with very position specific data allowing comparisons of various aspects of projected staffing with actual experience at various operators. The annual rail vehicle miles each system operates, its rail fleet size, and its annual rail operations budget have been provided to help the reader put the staffing data in perspective.

The survey is organized by operator and includes data from the Buffalo Light Rail Line, which, with its subway segment, is thought by some to be more comparable to future conditions on the Long Beach-Los Angeles Light Rail Line than are some of the simpler, all surface lines.

Non-Staffing Data

Each section on an individual system is prefaced with a system map and a page of summary financial and operating statistics provided to help put the staffing data that follows in perspective. This financial and operating data page provides overview data only and is not to the same degree of detail as the staffing data which follows, since this is a staffing survey rather than a comprehensive analysis of all aspects of operations. However, it is hoped that the data provided will give the reader some sense of the context in which the staff discussed in the pages that follow operates.

While the information provided should be helpful, it does not allow definitive measures of relative system non-staffing efficiency to be made. Such analysis of overall system efficiency would have to look at many indicators of efficiency as well as the goals of the systems involved, an undertaking substantially beyond the scope of this study, which is intended to focus on staffing practice in light rail.*

*It is important, when looking beyond staffing questions, to evaluations of overall system success to remember the great differences in goals amongst several of these systems. San Diego undertook to develop a business like system with a high fare box recovery ratio while Portland and Buffalo give free CBD rides to aid urban development, to site only one example. Thus systems overall may be less fairly comparable than certain subsystems like staffing practices.

Long Beach-Los Angeles Light Rail Line

The following pages show the projected District staffing for the Long Beach-Light Rail project. It is reprinted from the SRTP Rail Plan FY 88 through FY 92. They are reprinted here to allow comparison with the proposed staffing levels at other U.S. Light Rail systems. Following the staffing analysis, a Long Beach-Los Angeles Light Rail map is shown.

TRANSPORTATION DEPARTMENT LB LRT STAFFING

TRANSPORTATION DIVISION 11 STAFF

<u>Title</u>	<u>Positions</u>	<u>Notes</u>
Rail Operations Superintendent	0.5	A
Secretary	0.5	A
Division Transportation Manager	1	
Transit Operations Supervisors (Rail)	5	
for Division Dispatch	2	
for Instruction	8	
for Supervision	1	
Secretary	65	
Train Operators	<u>83</u>	

NOTES: A-shared with Metro Rail

CENTRAL CONTROL FACILITY STAFF

<u>Title</u>	<u>Positions</u>
Rail Control Center Supervisors	3
Transit Operations Supervisors (Rail)	5
for Communications Controller	5
for Train Dispatch	1
Secretary	8
Closed Circuit Television (CCTV) Monitors	<u>22</u>

Source: Joint SCRTD and LACTC staff estimates; subject to reduction and refinement as more detailed information becomes available from LACTC.



<u>Title</u>	<u>Positions</u>	<u>Notes</u>
Rail Equipment Maintenance Superintendent	0.5	A
Secretary	0.5	A
Engineer	1.5	A
Quality Assurance	3.0	
Instructor	1.0	
Warranty/Failure Analyst	1.0	
Maintenance Planner	1.0	
Rail Division Maintenance Manager	1.0	
Secretary	1.0	
Rail Senior Equipment Maintenance Sup.	1.0	
Clerk	1.0	
Rail Equipment Maintenance Supervisor	3.0	
Electro-Mechanics	26.0	
Vehicle Maintenance Mechanic	1.0	
Car Cleaners	11.0	
Storekeeper	1.0	B
Stockshop Clerks	2.0	B
	<u>56.5</u>	

Notes:

- A These positions and costs will be shared with Metro Rail.
- B Included for Office of Contracts, Procurement and Materiel (OCPM).

Source: Joint SCRTD and LACTC staff estimates; subject to reduction and refinement as more detailed information becomes available from LACTC.



MAINTENANCE DEPARTMENT
LB LRT STAFFING PLANS

TABLE II-3

FACILITIES MAINTENANCE LB LRT STAFFING PLAN

<u>Title</u>	<u>Positions</u>	<u>Notes</u>
Rail Facilities Maintenance Superintendent	0.5	A
Secretary	0.5	A
Supervisor II-Rail Electrical/Electronic	0.5	A
Secretary	0.5	A
Supervisor II-Maintenance of Way	0.5	A
Secretary	0.5	A
Supervisor I-Fare Collection	0.5	B
Fare Collection Technicians	4	
Supervisor I-Signal	0.5	B
Signal Technicians	7	
Supervisor I-Communications	0.5	B C
Electronic Communications Technicians	1	A C
Systems Electronic Communications Techs	7	C
Supervisor I-Traction Power	0.5	B
Traction Power Technicians	5	
Clerk - Electrical/Electronic	1	A
Supervisor I-Track	1	
Trackworkers	7	
Supervisor I-Property Maintenance	1	
Property Maintainers	2	A
Mopper/Waxers	4	
Clerk - Maintenance of Way	1	A
Supervisor I - Maintenance Control Center	1	
Maintenance Support Specialists	2	A
Civil/Mechanical Engineer	0.5	A
Electrical Engineer	0.5	A
Stores Clerk	2	A D
	<u>52.0</u>	

Notes:

- A Indicates a position that also has Metro Rail responsibilities. Salary and costs will actually be shared with Metro Rail start up activities at this time.
- B Indicates sharing of supervisor responsibilities between maintenance areas.
- C These personnel will be based out of the Central Maintenance Facility rather than the MOW building.
- D Office of Contracts, Procurement and Materiel positions.

Source: Joint SCRTD and LACTC staff estimates; subject to reduction and refinement as more detailed information becomes available from LACTC.



FACILITIES MAINTENANCE
LB LRT STAFFING PLAN

TABLE II-4

<u>Title</u>	<u>Responsibility</u>	<u>Positions</u>
Lieutenant	Management	1
Sergeants	Supervision	7
Security Guards	Revenue Protection	6
Security Guards	Yards/Shops and Central Control	9
Fare Inspectors	Fare Inspection	8
Staff Aid	Clerical	1
Secretary	Clerical	2
Radio Dispatchers	Radio Dispatch	4
Investigators	Train and Car Patrols	7
Transit Police Officers	Train and Car Patrols	<u>24</u> 69

Source: Joint SCRTD and LACTC staff estimates; subject to reduction and refinement as more detailed information becomes available from LACTC.



TRANSIT POLICE
LB LRT STAFFING PLAN

TABLE II-5

ESTIMATED LONG BEACH LIGHT RAIL OPERATING COST

<u>Department</u>	<u>Positions</u>	<u>Cost</u>
Transportation	105.0	\$ 4,536,000
Equipment Maintenance	56.5	\$ 2,835,000
Facilities Maintenance	52.0	\$ 3,613,000
Schedules	2.6	\$ 183,000
Transit Police	69.0	\$ 2,889,000
Traction Power, Utilities, etc.	—	\$ 3,418,000
TOTALS	285.1	\$17,474,000

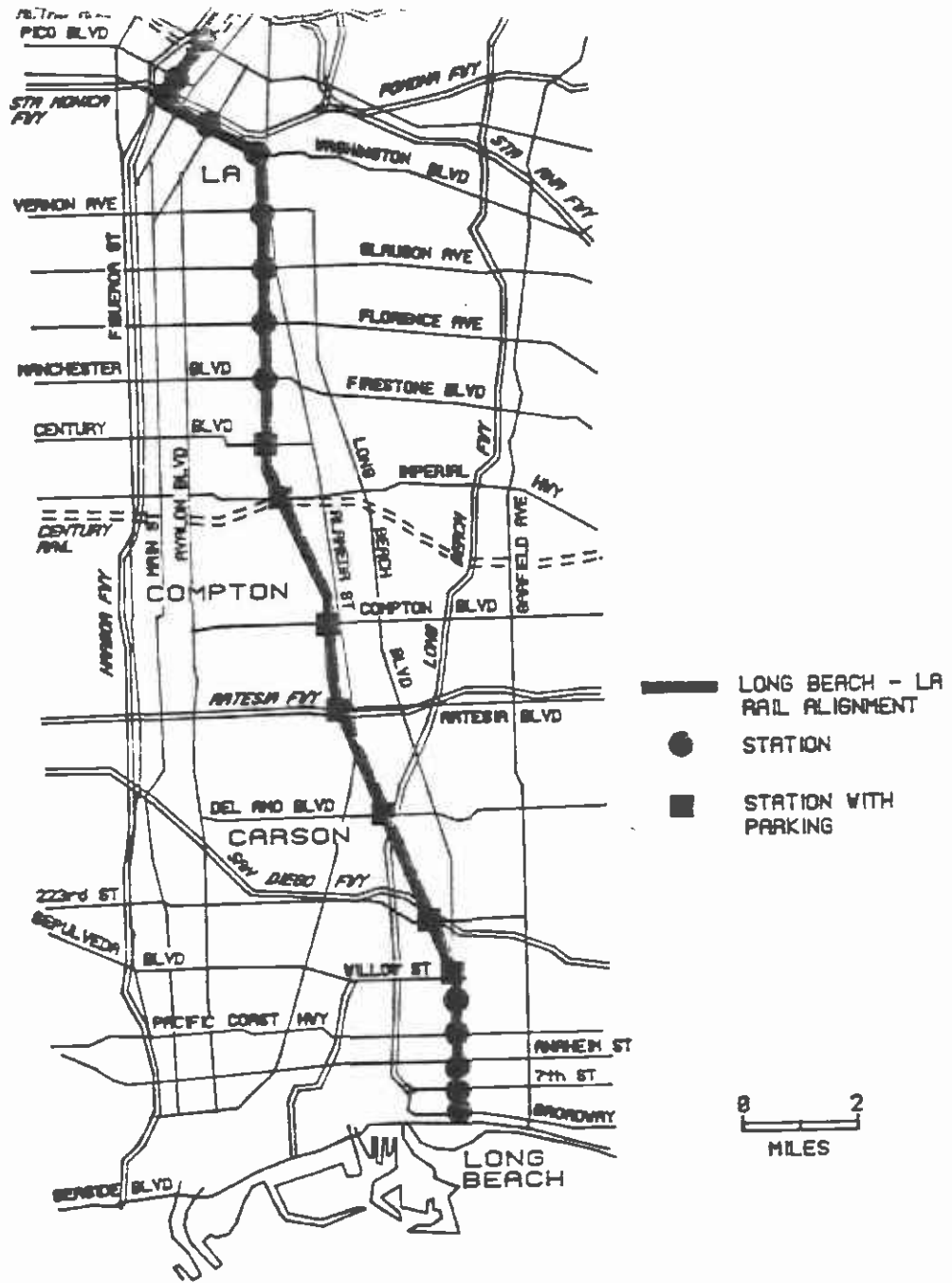
Note: Labor costs are in 1987 dollars. Departmental costs include non-labor costs, some of which were derived from Southern California Rail Consultants estimates and are in 1986 dollars. Since the majority of the costs are labor costs, for purposes of analysis 1987 dollars will be assumed.

Source: Joint SCRTD and LACTC staff estimates; subject to reduction and refinement as more detailed information becomes available from LACTC.



ESTIMATED LONG BEACH
LIGHT RAIL OPERATING COST

TABLE II-6



LONG BEACH-LOS ANGELES LIGHT RAIL ALIGNMENT

FIGURE II-A

San Diego

The following pages include a San Diego Trolley System Summary sheet, pages reprinted from the San Diego Trolley Fiscal Year 1988 Operating Budget, providing details of San Diego Trolley's FY 1987 and FY 1988 staffing, a San Diego Trolley Organizational Chart, a listing of additional MTDB positions attributable to San Diego Trolley operations, and a San Diego Trolley route map for the South Line.

San Diego Trolley

Light Rail System Service Summary

1. Number of Lines	2
2. Total Route Miles	35.4 km (total) East Line= 7.2 km, South Line= 28.2 km
3. Rail Fleet Size	30 Vehicles
4. Annual Vehicle Miles of Service	2,071,000
5. Budget	\$8,328,100
6. Annual Ridership	7 million
7. Total Staff	140

Source: Jane's Urban Transport System, 1987 and
MTDB, Planning Department

4.0 ORGANIZATION DISCUSSION

The FY 1988 SDTI Organization is depicted in Figure 4(a) and Figure 4(b). Illustrated by chart grouping and classification, all employment positions are included. The proposed budget reflects increased positions as follows:

Manager of Maintenance	
Maintenance Supervisor	(2)
Vault Supervisor	(1)
Operator	(1 F/T & 3 P/T)

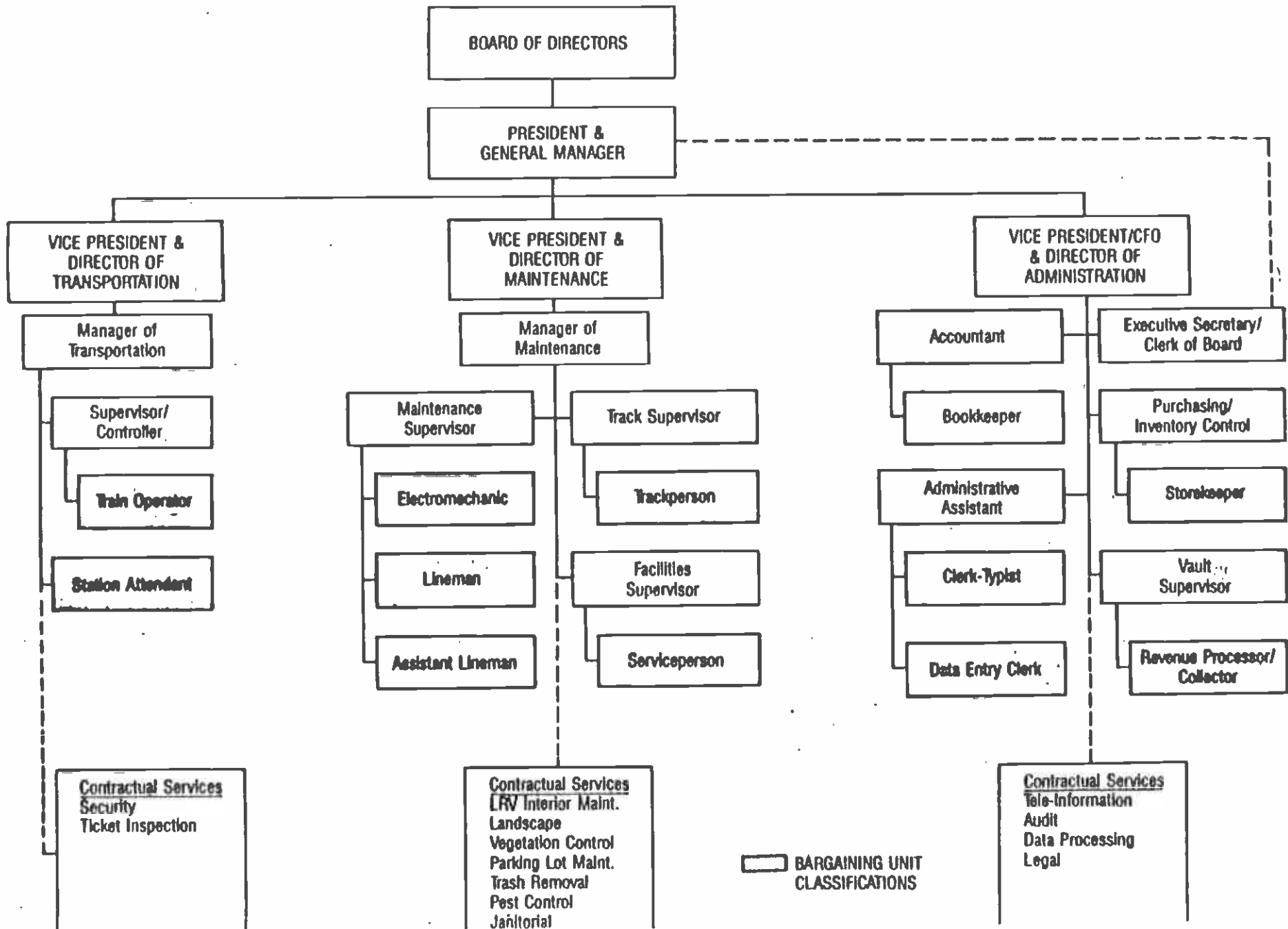
The additional Management support in Maintenance is desirable to provide extended supervisory presence and to better meet the constantly increasing monitoring and record keeping responsibility within the department.

The additional Vault Supervisor is necessary to provide extended supervisory presence and control.

The additional operators are required to provide for the extended weekend and evening service on the Euclid Line, as well as to provide relief coverage for vacations, sick time, holidays, etc., which are being covered increasingly by overtime.

SAN DIEGO TROLLEY, INC. ORGANIZATION CHART — FY 88

FIGURE 4 (a)



BARGAINING UNIT CLASSIFICATIONS

SAN DIEGO TROLLEY, INC. EMPLOYMENT CLASSIFICATIONS — FY 88

FIGURE 4(b)

	TOTAL FY 87	TOTAL FY 88
GENERAL MANAGER	1	1
DIRECTOR OF TRANSPORTATION	1	1
Manager of Transportation	1	1
Supervisor/Controller	11	11
Train Operator (Full-Time)	30	31
Train Operator (Part-Time)	15	18
Station Attendant (Part-Time)	3	3
DIRECTOR OF MAINTENANCE	1	1
Manager of Maintenance	0	1
Maintenance Supervisor	3	5
Electromechanic	7	7
Lineman	7	7
Assistant Lineman	16	18
Track Supervisor	1	1
Trackman	4	4
Facilities Supervisor	1	1
Serviceperson (Full-Time)	5	6
Serviceperson (Part-Time)	5	5
DIRECTOR OF ADMINISTRATION	1	1
Accountant	1	1
Bookkeeper	1	1
Administrative Assistant	1	1
Clerk-Typist	3	3
Data Entry Clerk	1	1
Executive Secretary/Clerk of Board	1	1
Purchasing/Inventory Control	1	1
Storekeeper	1	1
Vault Supervisor	1	2
Revenue Processor/Collector	6	6
FULL-TIME	107	112
PART-TIME	23	28
TOTAL	130	138
BARGAINING UNIT:		
FULL-TIME	80	81
PART-TIME	23	28
MANAGEMENT:		
TOTAL	130	138

12

===== Bargaining Unit Classifications

Additional Non-San Diego Trolley Staff

10 Fare inspectors provided by MTDB^{*}

* NOTE: The wages for these individuals as well as a \$400,000 contribution to a capital depreciation fund are included in the FY 87 \$8,328,100 trolley budget reported on an earlier page.

Table 1

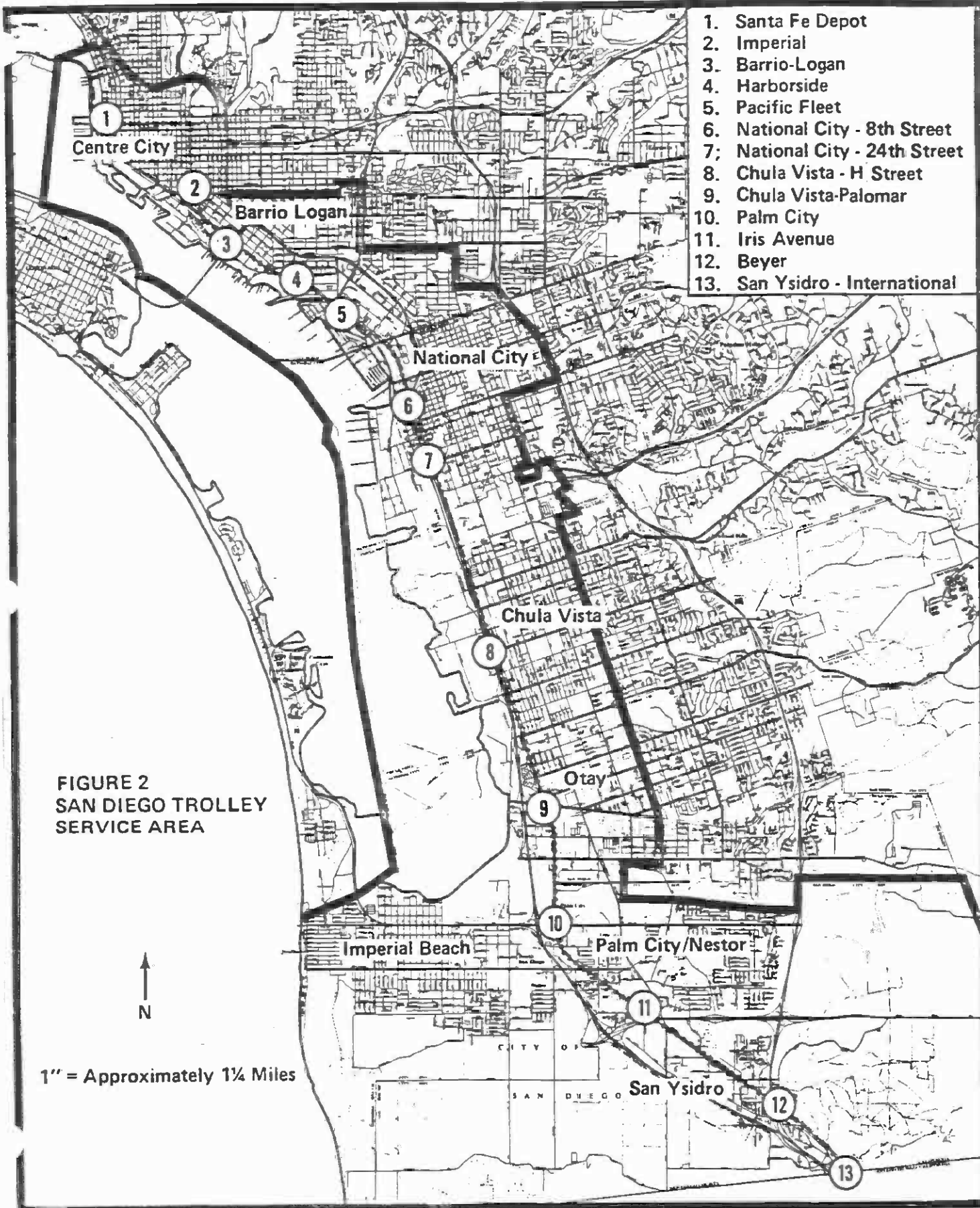
LIGHT RAIL OPERATIONS COMPARISON

<u>SYSTEM MEASURE</u>	<u>LONG BEACH/ LOS ANGELES LIGHT RAIL PROPOSED IN FY 87 DOLLARS</u>	<u>SAN DIEGO TROLLEY FY 87 ACTUAL</u>	<u>RATIO LA TO SAN DIEGO</u>
ANNUAL VEHICLE MILES TRAVELED	2,044,000	2,071,000	1 TO 1.013
RAIL VEHICLES	30	30	1 TO 1
BUDGET	\$17,474,000	\$8,328,100*	OVER 2 TO 1
STAFFING	285.1	140**	OVER 2 TO ONE

* THIS FIGURE INCLUDES THE WAGES OF FARE INSPECTORS WHO WORK FOR A SEPARATE AGENCY (MTDB) AND A \$400,000 CONTRIBUTION TO A CAPITAL DEPRECIATION FUND.

** THIS INCLUDES 23 PART-TIME WORKERS COUNTED HERE AS 1 FTE EACH FOR SIMPLICITY SAKE.

SOURCE: DRAFT SCR TD RAIL PLAN AND DENNIS WAHL, MTDB
PLANNING DEPARTMENT, 8/11/87, TELEPHONE: (619) 231-1466



1. Santa Fe Depot
2. Imperial
3. Barrio-Logan
4. Harborside
5. Pacific Fleet
6. National City - 8th Street
7. National City - 24th Street
8. Chula Vista - H Street
9. Chula Vista-Palomar
10. Palm City
11. Iris Avenue
12. Beyer
13. San Ysidro - International

**FIGURE 2
SAN DIEGO TROLLEY
SERVICE AREA**

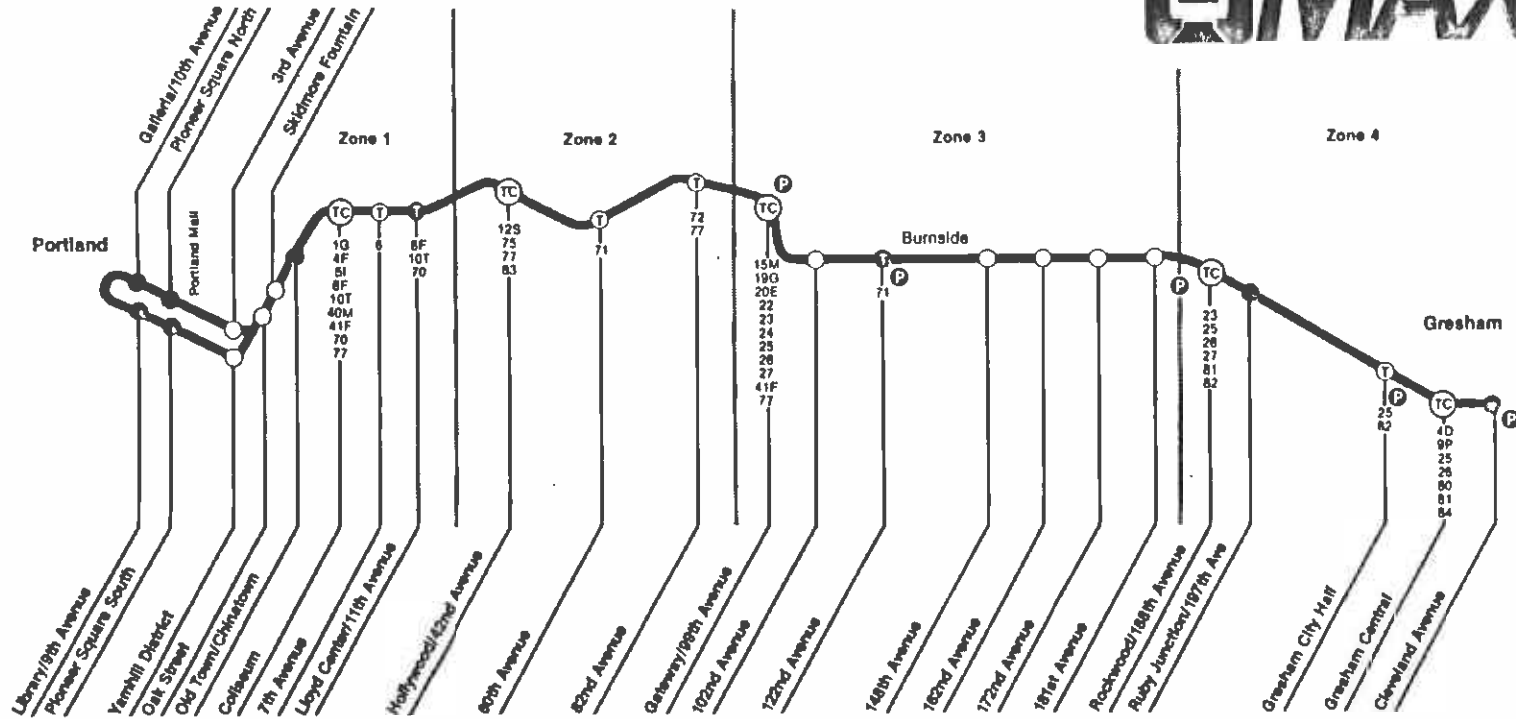


1" = Approximately 1/4 Miles

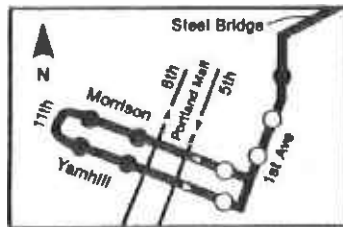
Portland, Oregon
Max
Light Rail System
Service Summary

1. Total number of lines = 1.
2. Total route miles = 15.
3. Rail fleet size = 26.
4. Annual vehicle miles of service = 71,501 in average month in the most recent year (858,012 year).
5. Annual operating budget = \$4,136,367 in FY 86/87 est.*
6. Ridership = 19,500 riders average weekday; up to 5,000 more on Saturdays
7. Total operating staff = 78.3

* Does not include funds for 10 joint bus/rail fare inspectors.



Downtown Inset



- Timepoint
- Ⓜ Transfer Point
- ⓂⓂ Transfer & Timepoint
- Ⓟ Park & Ride
- ⓂⓂⓂ Translt Center
- Zone Boundary



Department Summary

OPERATIONS - RAIL TRANSPORTATION

	Actual		Budget	Estimate	Budget	% Change	% of
	84/85	85/86	86/87	86/87	87/88	FY87-FY88	Dept Total
Personal Services	\$0	\$0	\$1,596,566	\$1,502,679	\$1,922,622	20.42%	92.37%
Materials and Services	\$0	\$0	\$195,965	\$127,803	\$158,875	-18.93%	7.63%
Total	\$0	\$0	\$1,792,531	\$1,630,482	\$2,081,497	16.12%	100.00%

PORTLAND
TRI-MET

UD1 Personal Services OPERATIONS - RAIL TRANSPORTATION

Position Title	Actual 84/85 Total	Actual 85/86 Total	— Budget 86/87 —			Est 86/87 Total	— Budget 87/88 —		
			Base	Pos	Total		Base	Pos	Total
Director			\$44,544	0.83	\$36,972	\$36,509	\$46,951	1	\$46,951
Manager			\$36,225	0.83	\$30,067	\$29,691	\$38,182	1	\$38,182
Controller/Supervisor			\$29,320	8.33	\$244,236	\$244,236	\$29,983	11	\$329,813
Secretary			\$20,253	0.83	\$16,810	\$16,810	\$21,333	0.5	\$10,667
Administrative Specialist			\$23,665	0.42	\$9,939	\$9,815	\$24,848	0.5	\$12,424
LRV Operator			\$25,395	25.83	\$655,953	\$655,953	\$26,954	33	\$889,482
Fringe Benefits					\$264,200	\$232,488			\$272,171
Unfunded Pension Liability					\$49,133	\$0			\$36,609
Workers Compensation					\$141,000	\$0			\$70,000
Unemployment Expense					\$0	\$0			\$0
Scheduled Overtime					\$98,539	\$166,708			\$141,747
Unscheduled Overtime					\$49,718	\$110,470			\$74,577
Total	\$0	\$0		37.07	\$1,596,566	\$1,502,679		47	\$1,922,623

BUD2 Materials & Services

OPERATIONS - RAIL TRANSPORTATION

Expense Category	Actual		Budget 86/87	Estimate 86/87	Budget 87/88	% Change FY87-FY88	% of M&S Total
	84/85	85/86					
Professional & Technical	\$0	\$0	\$1,000	\$0	\$1,000	0.00%	0.63%
Communications Contract Maint	\$0	\$0	\$20,000	\$175	\$0	-100.00%	0.00%
Temporary Help	\$0	\$0	\$500	\$415	\$0	-100.00%	0.00%
Graphics	\$0	\$0	\$5,000	\$8,053	\$5,000	0.00%	3.15%
Other Materials & Services	\$0	\$0	\$1,500	\$1,368	\$1,500	0.00%	0.94%
Travel & Meetings	\$0	\$0	\$3,500	\$0	\$2,000	-42.86%	1.26%
Training/Customer Relations	\$0	\$0	\$1,000	\$0	\$10,000	900.00%	6.29%
Operator Training	\$0	\$0	\$2,000	\$0	\$0	-100.00%	0.00%
Employee Communications	\$0	\$0	\$500	\$75	\$1,500	200.00%	0.94%
Dues & Subscriptions	\$0	\$0	\$75	\$0	\$75	0.00%	0.05%
Telephone	\$0	\$0	\$1,500	\$593	\$0	-100.00%	0.00%
Uniforms	\$0	\$0	\$6,390	\$3,125	\$5,800	-9.23%	3.65%
Self Insurance PL/PD	\$0	\$0	\$152,000	\$114,000	\$132,000	-13.16%	83.08%
Office Machines Lease	\$0	\$0	\$1,000	\$0	\$0	-100.00%	0.00%
Total	\$0	\$0	\$195,965	\$127,803	\$158,875	-18.93%	100.00%

Department Summary

OPERATIONS - RAIL MAINTENANCE

	Actual		Budget 86/87	Estimate 86/87	Budget 87/88	% Change FY87-FY88	% of Dept Total
	84/85	85/86					
Personal Services	\$0	\$0	\$1,526,741	\$1,500,888	\$2,106,929	38.00%	57.65%
Materials and Services	\$0	\$0	\$2,192,525	\$1,004,998	\$1,547,625	-29.41%	42.35%
Total	\$0	\$0	\$3,719,266	\$2,505,885	\$3,654,554	-1.74%	100.00%

BUD1 Personal Services

OPERATIONS - RAIL MAINTENANCE

Position Title	Actual 84/85 Total	Actual 85/86 Total	— Budget 86/87 —			Est 86/87 Total	— Budget 87/88 —		
			Base	Pos	Total		Base	Pos	Total
Director	\$0	\$0	\$44,544	0.83	\$36,972	\$36,509	\$46,951	1	\$46,951
Manager, Vehicle Maintenance	\$0	\$0	\$36,225	0.83	\$30,067	\$29,691	\$39,498	1	\$39,498
Manager, Maintenance of Way	\$0	\$0	\$35,667	0.83	\$29,604	\$29,234	\$37,595	1	\$37,595
Foreman, Vehicle Maintenance	\$0	\$0	\$30,977	1.67	\$51,732	\$51,732	\$32,629	3	\$97,887
Foreman, Maintenance of Way	\$0	\$0	\$30,977	0.83	\$25,711	\$25,711	\$32,629	1	\$32,629
Asst Foreman, Maintenance of W	\$0	\$0	\$25,395	0.83	\$21,078	\$21,078	\$26,749	0	\$0
Vehicle Mechanic	\$0	\$0	\$26,297	10	\$262,970	\$262,970	\$27,699	12	\$332,388
Plant Maint. Mechanic	\$0	\$0	\$26,297	2.5	\$65,743	\$65,743	\$27,699	3	\$83,097
Non-Rev. Vehicle Mechanic	\$0	\$0	\$26,297	0.83	\$21,827	\$21,827	\$27,699	0	\$0
Fare Coll/Lift Maintainer	\$0	\$0	\$26,297	5	\$131,485	\$131,485	\$27,699	5.5	\$152,345
Signal Maintainer	\$0	\$0	\$26,297	1.67	\$43,916	\$43,916	\$27,699	2	\$55,398
Track Maintainer	\$0	\$0	\$26,297	1.67	\$43,916	\$43,916	\$27,699	3	\$83,097
Maintenance of Way Laborer	\$0	\$0	\$25,395	2.5	\$63,488	\$63,488	\$26,749	3.5	\$93,622
Vehicle Cleaner	\$0	\$0	\$24,932	3.33	\$83,024	\$83,024	\$26,263	4	\$105,052
Maintenance of Way Cleaner	\$0	\$0	\$24,932	2.5	\$62,330	\$62,330	\$26,749	3.5	\$93,622
Helper	\$0	\$0	\$25,311	0.83	\$21,008	\$21,008	\$26,749	1	\$26,749
Administrative Specialist	\$0	\$0	\$24,627	0.42	\$10,343	\$10,214	\$24,848	0.5	\$12,424
Clerk	\$0	\$0	\$24,932	0.83	\$20,694	\$20,694	\$26,263	1	\$26,263
Secretary	\$0	\$0	\$20,253	0.83	\$16,810	\$16,810	\$21,333	0.5	\$10,667
Power Maintainer	\$0	\$0	\$26,297	2.5	\$65,743	\$65,743	\$27,699	3.5	\$96,947
Manager, Rail Maint Prog						\$0	\$34,000	1	\$34,000
Apprentice Vehicle Mech						\$0	\$20,680	1.5	\$31,020
Rail Maint Engineering Tech						\$0	\$30,000	1	\$30,000
Records Drafting Specialist						\$0	\$20,283	0.5	\$10,142
Fringe Benefits					\$238,824	\$223,213			\$314,846
Unfunded Pension Liability					\$51,410	\$0			\$40,693
Workers Compensation					\$70,000	\$3,750			\$40,000
Unemployment Expense					\$0	\$98			\$5,000
Overtime					\$58,050	\$166,708			\$175,000
Total	\$0	\$0		41.23	\$1,526,741	\$1,500,887		54	\$2,106,929

BUD2 Materials & Services

RAIL MAINTENANCE

Expense Category	Actual		Budget 86/87	Estimate 86/87	Budget 87/88	% Change FY87-FY88	% of M&S Total
	84/85	85/86					
Professional & Technical	\$0	\$0	\$2,000	\$0	\$2,000	0.00X	0.13X
Temporary Help	\$0	\$0	\$500	\$3,125	\$6,000	1100.00X	0.39X
Laundry	\$0	\$0	\$10,000	\$3,628	\$10,800	8.00X	0.70X
Contracted Maint (Way)	\$0	\$0	\$300,000	\$1,450	\$88,000	-70.67X	5.69X
Contr Maint (Facility & Equip)	\$0	\$0	\$0	\$0	\$25,350		1.64X
Elevator Maintenance	\$0	\$0	\$0	\$0	\$14,500		0.94X
Computer Maintenance	\$0	\$0	\$0	\$0	\$5,000		0.32X
Security	\$0	\$0	\$50,000	\$136,685	\$0	-100.00X	0.00X
Electrical Power (Propulsion)	\$0	\$0	\$840,000	\$621,528	\$595,000	-29.17X	38.45X
Fuel(Service Vehicles)	\$0	\$0	\$12,000	\$3,540	\$23,000	91.67X	1.49X
Maintenance Materials & Equip	\$0	\$0	\$371,000	\$40,470	\$0	-100.00X	0.00X
LRV & Fare/Lift	\$0	\$0	\$0	\$0	\$225,000		14.54X
Maintenance of Way	\$0	\$0	\$0	\$0	\$100,000		6.46X
Repair Materials (LRV)	\$0	\$0	\$315,400	\$8,105	\$50,000	-84.15X	3.23X
Repair Materials Service Equip	\$0	\$0	\$0	\$0	\$24,000		1.55X
Cleaning Supplies	\$0	\$0	\$14,500	\$6,618	\$12,000	-17.24X	0.78X
Small Hand Tools	\$0	\$0	\$4,000	\$2,220	\$1,500	-62.50X	0.10X
Other Materials & Services	\$0	\$0	\$10,800	\$33,535	\$42,000	288.89X	2.71X
Utilities (Way)	\$0	\$0	\$0	\$0	\$69,000		4.46X
Building Utilities	\$0	\$0	\$170,000	\$98,323	\$158,400	-6.82X	10.24X
Steel Bridge Maint Agreement	\$0	\$0	\$49,250	\$23,028	\$38,300	-22.23X	2.47X
Rentals	\$0	\$0	\$5,000	\$0	\$3,000	-40.00X	0.19X
Travel & Meetings	\$0	\$0	\$4,000	\$48	\$2,000	-50.00X	0.13X
Training & Education	\$0	\$0	\$12,000	\$0	\$10,000	-16.67X	0.65X
Employee Communications	\$0	\$0	\$2,000	\$0	\$1,000	-50.00X	0.06X
Dues & Subscriptions	\$0	\$0	\$75	\$130	\$75	0.00X	0.00X
Telephone	\$0	\$0	\$20,000	\$22,568	\$41,700	108.50X	2.69X
Total	\$0	\$0	\$2,192,525	\$1,004,998	\$1,547,625	-29.41X	100.00X

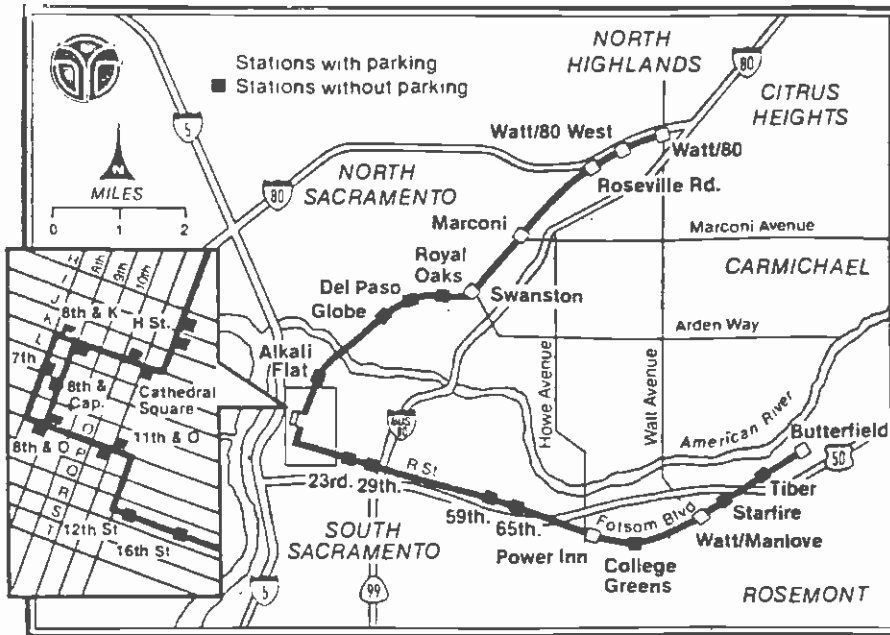
**Additional Portland
Max Staff**

10 Fare Inspectors*

*These Fare Inspectors inspect both bus riders (correct payment outside the Downtown Free Fare Zone) and rail patrons.

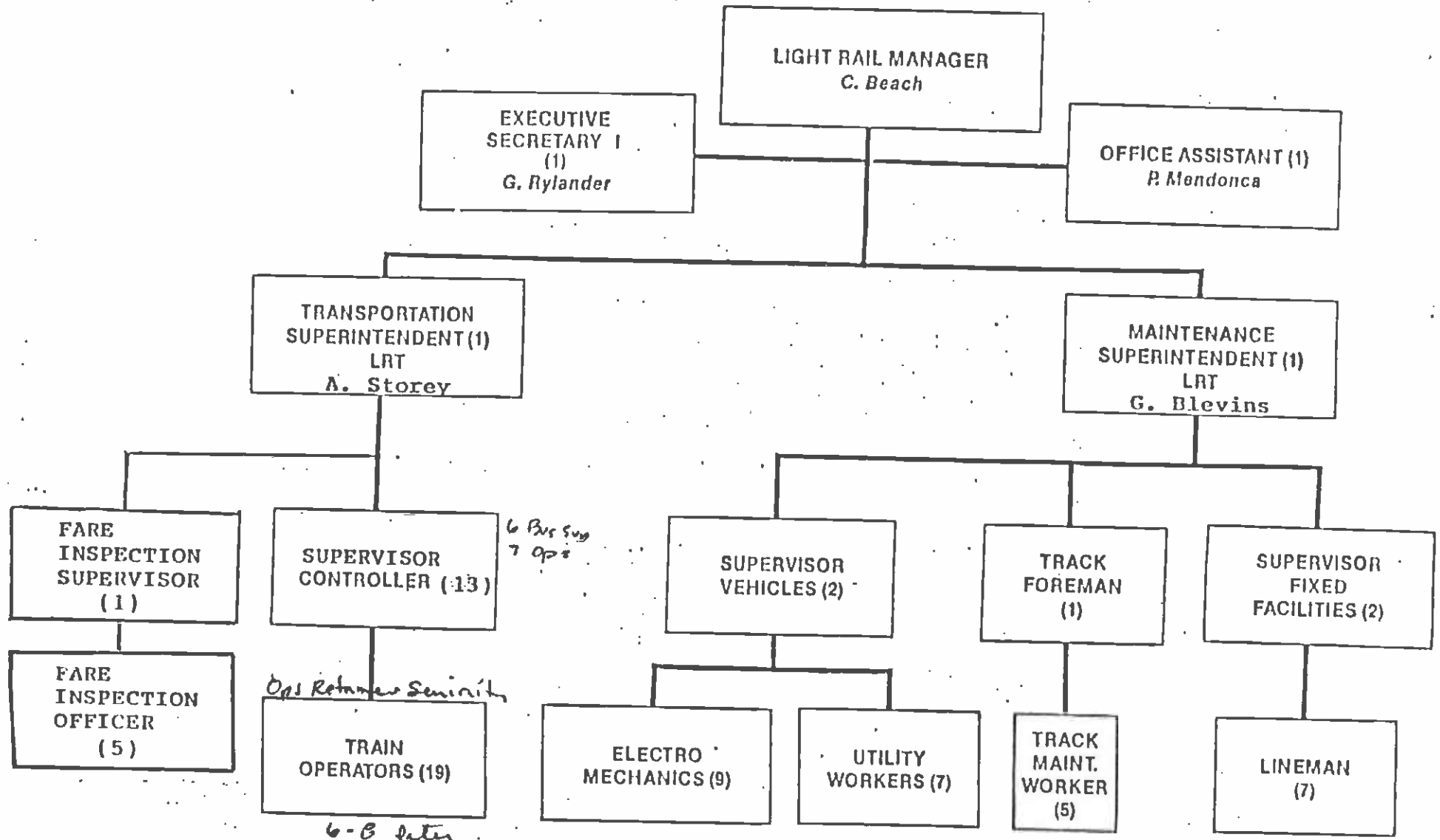
Sacramento Light Rail
System Service Summary

1. Number of Lines = 1
2. Total Route Miles = 18.3
3. Rail Fleet Size = 26
4. Annual Vehicle Miles = 1.230 million miles of service
5. Budget = \$7,400,000
6. Ridership =
7. Total Operating Staff = 76



5/1/86

LIGHT RAIL DEPARTMENT ORGANIZATION



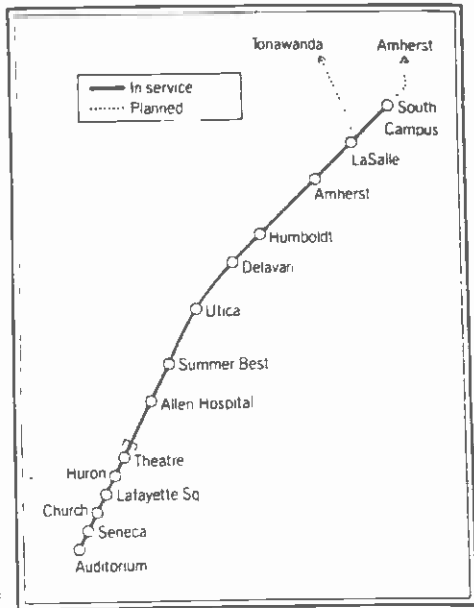
Authorized Filling: 76

**Buffalo Light Rail
System Service Summary**

1. Number of Lines = 1
2. Total Route Miles = 6.4 miles (5.2 miles in tunnel)*
3. Rail Fleet Size = 27*
4. Annual Vehicle Miles of Service = 700,435**
5. Annual Operating Budget = \$10 million**
6. Annual Ridership = 10.7 - 11.9 million estimated 1st year ridership*
7. Total Operating Staff = 156

*Source: Jane's World Railways 1986-87

**Planning Department, Niagara Frontier Transit Metro system Inc.



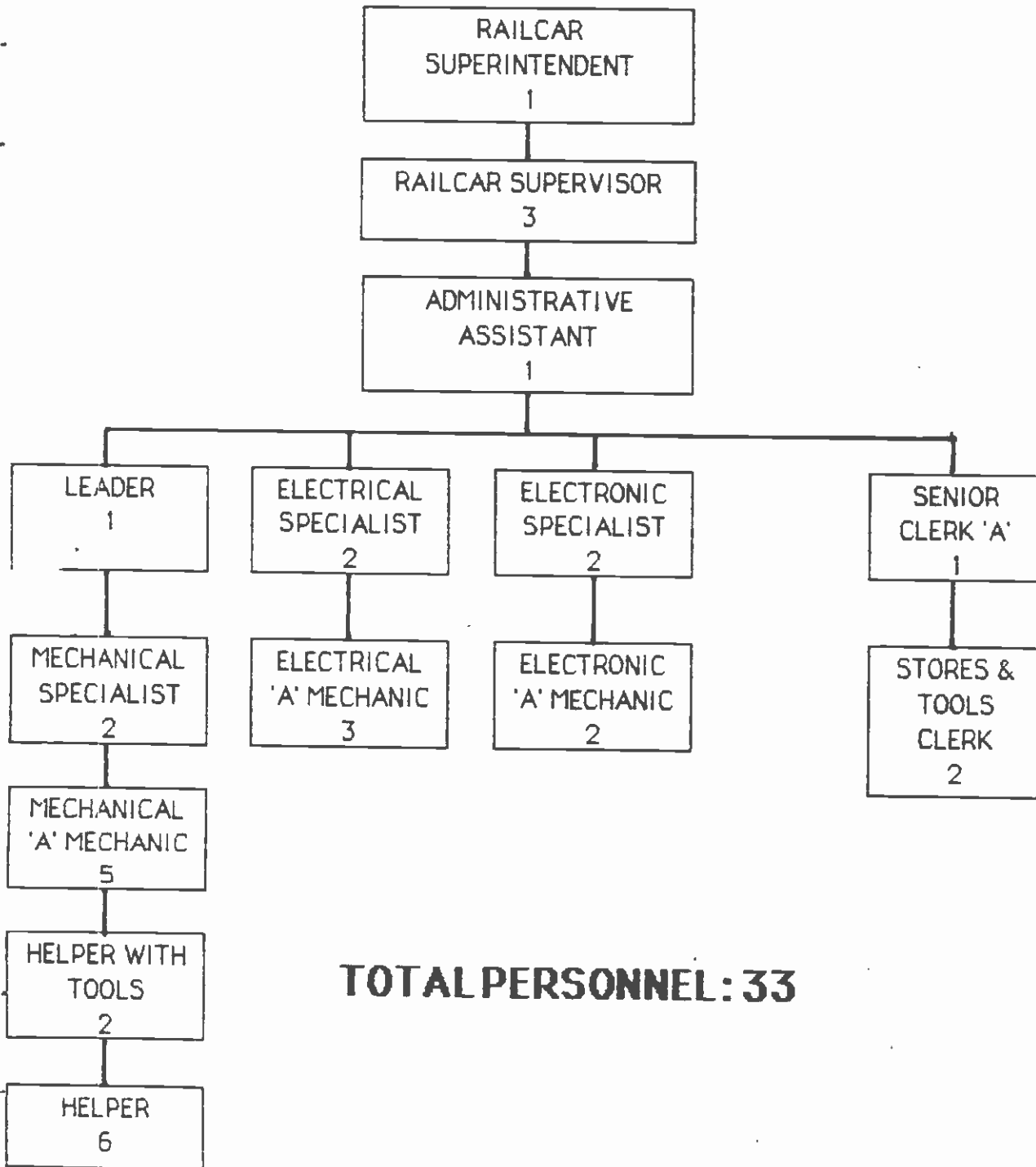
Buffalo's light rail line

Buffalo Light Rail Operations Staffing

<u>Position</u>	<u>Number</u>	<u>Description</u>
Operations Control Center (O.C.C.) Manager	2	(Supervises train controllers and street supervisors) Expect to use one only in the future plus a rotating weekend management person.
Manager	1	Supervises operators and clerks.
Clerks	3	Union position.
Normal Operators	16	Currently using 7 bus operators due to a shortage of permanent rail operators.
Extra Board Operators	2	16 runs.
Street Supervisors	5	10 hour days.
Train Controllers	<u>6</u>	They rotate an 8-hour Sunday overtime shift. Only one allowed on vacation at a time and this requires overtime by the others.
Total	35	

Source: Mr. Jim Bishop, Buffalo O.C.C. Manager

RAILCAR DEPARTMENT PERSONNEL



TOTAL PERSONNEL: 33

RAIL CAR DEPT. PERSONNEL WORK SCHEDULE

RAIL CAR MAINTENANCE

FIRST SHIFT

JOB TITLE	DAYS WORKED	HOURS	R.D.O.
Mech.Specialist	Mon.-Fri.	7:30a.m.-4:00p.m.	Sat.-Sun.
Mechanic "A"	Sun.-Thurs.	7:30a.m.-4:00p.m.	Fri.-Sat.
Relief Mech "A"	Mon.-Fri.	7:30a.m.-4:00p.m.	Sat.-Sun.
Mechanic "A"	Tues.-Sat.	7:30a.m.-4:00p.m.	Sun.-Mon.
Electronic Spec.	Mon.-Fri.	7:30a.m.-4:00p.m.	Sat.-Sun.
Electrical Spec.	Mon.-Fri.	7:30a.m.-4:00p.m.	Sat.-Sun.
Electrical Mech."A"	Sun.-Thurs.	7:30a.m.-4:00p.m.	Mon.-Fri.
Relief Electric			
Mechanic "A"	Mon.-Fri.	7:30a.m.-4:00p.m.	Mon.-Fri.
Electronic Mechn."A"	Tues.-Sat.	7:30a.m.-4:00p.m.	Tues.-Sat.
Helper W/Tools	Mon.-Fri.	7:30a.m.-4:00p.m.	Mon.-Fri.
Relief Helper ^(<i>CKM EL</i>) Without Tools	Tues.-Sat.	7:30a.m.-4:00p.m.	Mon.-Fri.

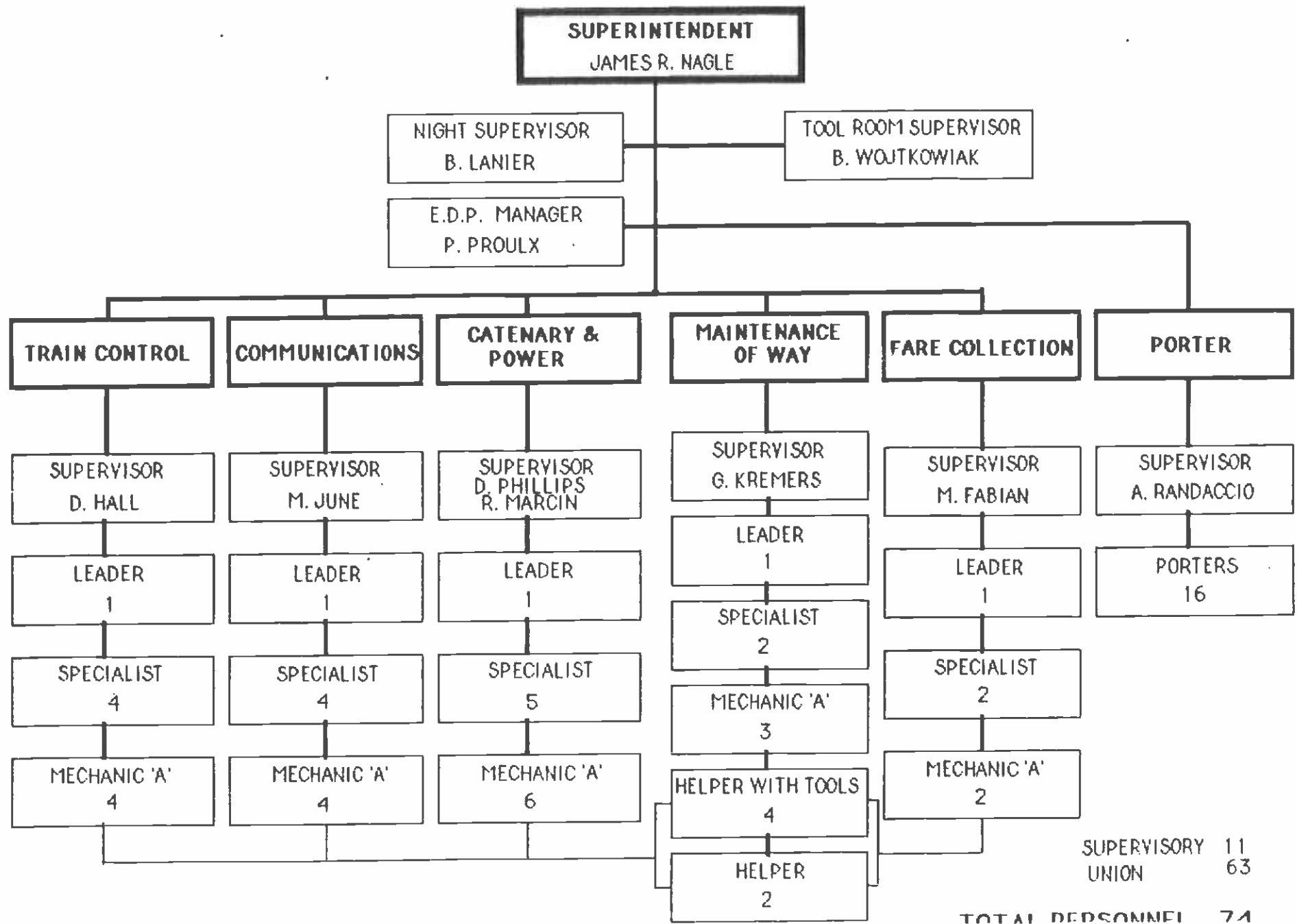
SECOND SHIFT

Mech.Specialist	Mon.-Fri.	3:30p.m.-12:00M	Sat.-Sun.
Mechanic "A"	Mon.-Fri.	3:30p.m.-12:00M	Sat.-Sun.
Electronic Spec.	Mon.-Fri.	3:30p.m.-12:00M	Sat.-Sun.
Electrical Spec.	Mon.-Fri.	3:30p.m.-12:00M	Sat.-Sun.
Electronic Mech."A"	Mon.-Fri.	3:30p.m.-12:00M	Sat.-Sun.
Helper W/Tools	Mon.-Fri.	3:30p.m.-12:00M	Sat.-Sun.
Helper Without Tools <i>(CAR CLEANER)</i>	Mon.-Fri.	3:30p.m.-12:00M	Sat.-Sun.

THIRD SHIFT

Leader	Sun.-Thurs.	11:30p.m.-7:30a.m.	Fri.-Sat.
Mechanic "A"	Sun.-Thurs.	11:30p.m.-7:30a.m.	Fri.-Sat.
Electrical Mech."A"	Sun.-Thurs.	11:30p.m.-7:30a.m.	Fri.-Sat.
Helper	Sun.-Thurs.	11:30p.m.-7:30a.m.	Fri.-Sat.
Helper { <i>CLK</i>	Sun.-Thurs.	11:30p.m.-7:30a.m.	Fri.-Sat.
Helper { <i>CHK WKS</i>	Sun.-Thurs.	11:30p.m.-7:30a.m.	Fri.-Sat.
Helper	Sun.-Thurs.	11:30p.m.-7:30a.m.	Fri.-Sat.

WAY AND POWER DEPARTMENT



SUPERVISORY 11
UNION 63

TOTAL PERSONNEL 74

.012
ADPD. 9-62

WAY AND STRUC JRE DEPARTMENT

DATE Effective October 11, 1987
 A: 7:30AM-4:00PM
 SHIFT B: 3:30PM-12:00Midnight
 C: 11:30PM-8:00AM

LOCATION South Park Yard and Shop
 A: 12:00Noon-12:30PM
 LUNCH PERIOD B: 8:00PM-8:30PM
 C: 4:00AM-4:30PM

ACCT. NO.	CLASS	RATE	HOURS	S	M	T	W	T	F	S	NATURE OF WORK	NAME
A	Relief HVAC Specialist		7:30AM-4:00PM Or as assigned		X	X	X	X	X		Way and Structure work as assigned	
A	Mechanic "A"		7:30AM-4:00PM		X	X	X	X	X		Way and Structure work as assigned	
A	Relief Helper with Tools		7:30AM-4:00PM		X	X	X	X	X		Way and Structure work as assigned	
A	Helper Without Tools		7:30AM-4:00PM		X	X	X	X	X		Way and Structure work as assigned	
A	Helper with Tools		7:30AM-4:00PM		X	X	X	X	X		Way and Structure work as assigned	
B	Leader		3:30PM-12:00AM		X	X	X	X	X		Way and Structure work as assigned	
B	Mechanic "A"		3:30PM-12:00AM		X	X	X	X	X		Way and Structure work as assigned	
B	Helper without Tools		3:30PM-12:00AM		X	X	X	X	X		Way and Structure work as assigned	
C	Trackwork Specialist		11:30PM-8:00AM	X	X	X	X	X			Way and Structure work as assigned	
C	Mechanic "A"		11:30PM-8:00AM	X	X	X	X	X			Way and Structure work as assigned	
C	Helper with Tools		11:30PM-8:00AM	X	X	X	X	X			Way and Structure work as assigned	
C	Helper with Tools		11:30PM-8:00AM	X	X	X	X	X			Way and Structure work as assigned	

NIAGARA FRONTIER TRANSIT METRO SYSTEM

L. R. R. T.

Job Descriptions

CLASS TITLE: RAIL CAR EQUIPMENT SUPERINTENDENT

GENERAL STATEMENT OF DUTIES: The job involves overall responsibility for rail car maintenance functions, including service and repair of dies, trucks, brakes, motors, air systems, wiring systems, controls and interior furnishings; and personnel administration. It consists of overseeing department operation; issuing orders and procedures; making real-time decisions on the handling of emergencies and other unusual conditions; taking proper action when unsafe or irregular acts or conditions are observed or reported; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property. Work is performed with wide latitude for independent judgment and action.

RESPONSIBILITIES:

- Accept responsibility for the operation of the Maintenance Department on any shift, at any time, when so directed by the Vice President of Maintenance and Equipment.
- Plan, coordinate and direct the work of subordinate supervisors and employees engaged in the inspection, test, repair, overhaul and replacement of rail vehicles.
- Advise subordinates on difficult or unusual problems or repairs.
- Handle union grievances.
- Inspect and test rail vehicle and shop components and systems to verify that they are being properly used and maintained in accordance with applicable operational and safety regulations.
- Instruct personnel in approved work practices and procedures.
- Maintain an adequate inventory of parts and supplies, update parts books and price lists, prepare and maintain records, and prepare reports.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Establish shop and field operating policies and procedures.
- Direct or assist in all manner of emergency repairs necessary to move a disabled car so that service can be resumed.
- Develop a knowledge of Company policies pertaining to the work involved.

DESIRABLE KNOWLEDGE, ABILITIES, SKILLS, EDUCATION AND EXPERIENCE:

- College degree in Electrical Engineering, with extensive work experience in the theory, practice and management of electric rail vehicle maintenance and repair, or an equivalent combination of education and experience.
- Thorough knowledge of applicable governmental regulations.

Rail Car Equipment Superintendent (Cont'd)

- Thorough knowledge of the techniques commonly used in the repair and servicing of electric rail vehicles.
- Thorough knowledge of the hazards and required safety precautions of the trade, including those associated with high voltage electricity.
- Ability to plan and supervise the work of subordinates, and to make efficient use of labor and materials.
- Satisfactory prior work record.
- Ability to instruct students effectively.
- Ability to express ideas effectively, both orally and in writing.
- Ability to maintain an effective working relationship with other employees.
- Ability to interface with the public and outside agencies courteously and effectively.

CLASS TITLE: SENIOR CLERK A - MECHANICAL DEPARTMENT - RAIL

GENERAL STATEMENT OF DUTIES: The job involves all manner of procedures relative to time-keeping, budget control and general office business. It consists of compiling and supplying statistical information; calculating data; taking dictation and transcribing expressed subject material; typing and operating office machines; processing reports and forms; keeping records; preparing reports and statements; performing tasks incidental to such procedures; and performing generally comparable and related tasks as directed.

RESPONSIBILITIES

- Prepare, type, record and report payroll accounts, changes and expenditures.
- Compare and check requisitions, invoices, time cards and records.
- Obtain and post data and information in office records or files; prepare and type office lists, reports and records, summaries, recapitulations and distribution of prices, credits and expenditures.
- Post charges, credits and expenditures for shop and garage accounts, and prepare special reports relative to material, labor and service charges and accounts.
- Take dictation at the rate of 120 words per minute, transcribe dictated material at the rate of 60 words per minute, and type straight copy of typed material at the rate of 70 words per minute.
- Operate common office machines and appurtenances consistent with practical standards of proficiency, and assist working associates in routine office procedures; assume responsibility for first aid measures and procedure.
- Perform within the department or in other departments, by special assignment, directions or instructions, any work requiring a degree of qualification, skill, ability or experience which is less than or comparable to that required for this job, and perform all duties with a speed and accuracy satisfactory to supervisory authorities.
- Take instructions and assignments to qualify for work in other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Explain and demonstrate to others all job details, methods and procedures when directed to do so by the department supervisor or his deputies.
- The duties stated above are an outline of duties that are performed. There may be other duties and tasks assigned that are not stated in the above responsibilities which will become part of this or any job as directed by Supervision.

DESIRABLE KNOWLEDGE, ABILITIES, SKILLS, EDUCATION AND EXPERIENCE

- Must be able to express ideas effectively, orally and in writing.
- Must be able to maintain effective working relationship with all employees.
- Graduation from a credited high school or equivalent combination of education and experience.

RAIL CAR
CLASS TITLE: ELECTRICAL SUPERVISOR

GENERAL STATEMENT OF DUTIES: The job involves the supervision of skilled, semi-skilled and unskilled subordinates who repair and service electrical systems and components on light rail vehicles and shop equipment. It consists of insuring the availability of qualified personnel to fill scheduled and unscheduled needs; verifying that employees are fit for duty and qualified to perform the work assigned; administering discipline; taking proper action when unsafe or irregular acts or conditions are observed or reported; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Accept responsibility for the operation of the department on any shift, at any time, when so directed by the Rail Car Equipment Superintendent.
- Plan activities, assign work, and supervise a staff of employees engaged in the inspection, test, repair, overhaul and replacement of rail car wiring systems, motors, circuit breakers, relays, controls and/or components thereof.
- Diagnose complex electrical and electronic malfunctions; interpret blueprints, wiring diagrams and maintenance manuals; and advise subordinates on difficult or unusual problems or repairs.
- Inspect and test vehicle electrical systems and components to verify that they are being properly used and maintained in accordance with applicable operational and safety regulations.
- Maintain an adequate inventory of parts and supplies, update parts books and price lists, prepare and maintain records, and prepare reports
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Direct or assist in all manner of emergency repairs necessary to move a disabled car so that service can be resumed.
- Develop a knowledge of Company policies pertaining to the work involved.

DESIRABLE KNOWLEDGE, ABILITIES, SKILLS, EDUCATION AND EXPERIENCE:

- College degree in Electrical or Electronic Engineering, and a minimum of three years work experience in the rail transit industry, or an equivalent combination of education and experience.
- Thorough knowledge of repair and servicing techniques associated with electrically powered rail vehicles of modern design.
- Thorough knowledge of the hazards and required safety precautions of the trade, including those associated with high voltage electricity.
- Ability to plan and supervise the work of subordinates, and to make efficient use of labor and materials.

12.28.83

- Satisfactory prior work record.
- Ability to instruct students effectively.
- Ability to express ideas effectively, both orally and in writing.
- Ability to maintain an effective working relationship with other employees.
- Ability to interface with the public and outside agencies courteously and effectively.

CLASS TITLE: RAIL CAR LEADER

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the Rail Car Department at any location connected with the operation of the Company's rail system with most work being performed at the Yard and Shop complex. It consists of reading and interpreting instruction sheets, blue prints and wiring diagrams; analyzing defects in rail car or shop equipment, parts and mechanisms; setting up machine tools and equipment; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and protecting company property.

RESPONSIBILITIES:

- Accept responsibility for the operation of the section on any shift at any time when so directed by the assigned Supervisors.
- Assign work duties and supervise subordinates to insure work is performed correctly, completely, and in a timely fashion.
- Maintain all necessary equipment repair records and division reports.
- Discover defective, unserviceable or deteriorating conditions in Rail Car mechanical and/or electrical systems, units or parts: diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Perform periodic inspections and preventive maintenance on Rail Car mechanical and/or electrical systems and components, and properly maintain records of same.
- Be able to make emergency repairs necessary to safely move a disabled rail car or train with minimum delay.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications and perform all duties with a speed and accuracy satisfactory to company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid N.Y. Class 2 and 3 drivers license.
- Perform other duties and tasks not stated above, but which may become a part of this or any job as directed by company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a college graduate and/or equivalent combination of education and experience.
- Must be able to interpret and apply all standard procedures set forth in manufacturers' instruction manuals.
- Must be able to make all repairs and maintenance checks required.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: ELECTRICAL SPECIALIST

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blue prints and wiring diagrams; analyzing defects in rail car or shop equipment, parts and mechanisms; setting up machine tools and equipment, setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties, and the protecting of Company property.

RESPONSIBILITIES:

- Read and correctly interpret blue prints, instruction sheets and manuals, and wiring diagrams.
- Discover defective, unserviceable or deteriorating conditions in electrical systems, units or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand rail vehicle high voltage (nominal 650 VDC) and low voltage (37.5 VDC) systems, wiring and equipment, and test procedures and safety precautions regarding work on same.
- Understand and be proficient in the use of complex electrical test equipment, including but not limited to oscilloscopes, ammeters, ohmmeters, voltmeters and ultrasonic detection devices.
- Test, repair or replace rail car electrical systems or components, including but not limited to chopper control systems, relays, switches, connectors, climate control systems and motors, lighting systems components, wiring, traction motors, batteries and circuit breakers.
- Test, troubleshoot and repair defects in complex vehicle and shop wiring systems.
- Perform periodic inspections and preventive maintenance on electrical systems and components, and properly maintain records of same.
- Be able to make emergency repairs necessary to safely move a disabled rail car or train with minimum delay.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.

Electrical Specialist (Cont'd)

- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must have two years of formal solid-state electronic technician training and one year of work experience applying such training, or three years of experience as an electronic technician.
- Must have and be able to demonstrate an understanding of digital and analog circuitry.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: ELECTRICAL MECHANIC "A"

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blue prints and wiring diagrams; analyzing defects in rail car or shop equipment, parts and mechanisms; setting up machine tools and equipment, setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties, and the protecting of Company property.

RESPONSIBILITIES:

- Read and correctly interpret blue prints, instruction sheets and manuals, and wiring diagrams.
- Discover defective, unserviceable or deteriorating conditions in electrical systems, units or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand rail vehicle high voltage (nominal 650 VDC) and low voltage (37.5 VDC) systems, wiring and equipment, and test procedures and safety precautions regarding work on same.
- Understand and be proficient in the use of complex electrical test equipment, including but not limited to oscilloscopes, ammeters, ohmmeters, voltmeters and ultrasonic detection devices.
- Test, repair or replace rail car electrical systems or components, including but not limited to chopper control systems, relays, switches, connectors, climate control systems and motors, lighting systems components, wiring, traction motors, batteries and circuit breakers.
- Test, troubleshoot and repair defects in complex vehicle and shop wiring systems.
- Perform periodic inspections and preventive maintenance on electrical systems and components, and properly maintain records of same.
- Be able to make emergency repairs necessary to safely move a disabled rail car or train with minimum delay.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.

- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a high school graduate.
- Must have three years of highly skilled maintenance experience, including the demonstrated ability to locate, diagnose, repair, replace or modify complex pneumatic, hydraulic, electrical and mechanical components.
- Must have the demonstrated ability to read, understand and work in accordance with blueprints, drawings, layouts and other specifications.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: ELECTRONIC SPECIALIST

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blue prints and wiring diagrams; analyzing defects in rail car or shop equipment, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES

- Read and correctly interpret blue prints, instruction sheets and manuals, and wiring diagrams.
- Discover defective, unserviceable or deteriorating conditions in electronic systems, units, or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand rail vehicle high voltage (nominal 650 VDC) and low voltage (nominal 37.5 VDC) systems, wiring and equipment, and safety precautions regarding work on same.
- Understand and be proficient in the use of complex electrical test equipment, including but not limited to oscilloscopes, ammeters, ohmmeters, voltmeters, and ultrasonic detection devices.
- Test, repair or replace rail car electronic systems or components, including but not limited to chopper control systems, printed circuit boards, control circuits, intercoms, converters, battery chargers, and status indication systems.
- Test, troubleshoot and repair defects in complex vehicle and shop wiring systems.
- Perform periodic inspections and preventive maintenance on electronic systems and components, and properly maintain records of same.
- Be able to make emergency repairs necessary to safely move a disabled rail car or train with minimum delay.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved

Electronic Specialist (Cont'd)

- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION

- Must have two years of formal solid-state electronic technician training and one year of work experience applying such training, or three years of experience as an electronic technician.
- Must have and be able to demonstrate an understanding of digital and analog circuitry.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blue prints and wiring diagrams; analyzing defects in rail car or shop equipment, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES

- Read and correctly interpret blue prints, instruction sheets and manuals, and wiring diagrams.
- Discover defective, unserviceable or deteriorating conditions in electronic systems, units, or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand rail vehicle high voltage (nominal 650 VDC) and low voltage (nominal 37.5 VDC) systems, wiring and equipment, and safety precautions regarding work on same.
- Understand and be proficient in the use of complex electrical test equipment, including but not limited to oscilloscopes, ammeters, ohmmeters, voltmeters, and ultrasonic detection devices.
- Test, repair or replace rail car electronic systems or components, including but not limited to chopper control systems, printed circuit boards, control circuits, intercoms, converters, battery chargers, and status indication systems.
- Test, troubleshoot and repair defects in complex vehicle and shop wiring systems.
- Perform periodic inspections and preventive maintenance on electronic systems and components, and properly maintain records of same.
- Be able to make emergency repairs necessary to safely move a disabled rail car or train with minimum delay.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.

Electronic Mechanic "A" (Cont'd)

- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION

- Must be a high school graduate.
- Must have three years of highly skilled maintenance experience, including the demonstrated ability to locate, diagnose, repair, replace or modify complex pneumatic, hydraulic, electrical and mechanical components.
- Must have the demonstrated ability to read, understand and work in accordance with blueprints, drawings, layouts and other specifications.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: MECHANICAL SPECIALIST

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets and blueprints; analyzing defects in rail car or shop equipment, parts and mechanisms; setting up machine tools and equipment; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Read and correctly interpret blueprints, instruction sheets and manuals.
- Discover defective, unserviceable or deteriorating conditions in mechanical systems, units or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Test, repair or replace rail car mechanically or pneumatically operated systems or components, including but not limited to compressors, door and step components, truck and wheel assemblies, suspension and brake gear, gear boxes, couplers, pantographs and heating/air conditioning equipment.
- Perform all types of complicated layouts and machine setups, as well as precision machine work on lathes, milling machines, shear, wheel lathe and grinders.
- Perform all required acetylene burning, gas, arc and heliarc welding. ^{not in "Med A"} ✓
- Perform periodic inspections and preventive maintenance on mechanical systems and components, and properly maintain records of same.
- Be able to make emergency repairs necessary to safely move a disabled rail car or train with minimum delay.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.

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- MECHANICAL OP. ... (CONT'D)
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a high school graduate or have an equivalent combination of education and experience.
- Must have and be able to demonstrate an understanding of machine shop practice, and repair and welding techniques.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must have a satisfactory prior work record.
- Must be able to express ideas effectively, both orally and in writing.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: MECHANIC "A" - MECHANICAL UTILITY

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets and blueprints; analyzing defects in rail car or shop equipment, parts and mechanisms; setting up machine tools and equipment; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Read and correctly interpret blueprints, instruction sheets and manuals.
- Discover defective, unserviceable or deteriorating conditions in mechanical systems, units or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Test, repair or replace rail car mechanically or pneumatically operated systems or components, including but not limited to compressors, door and step components, truck and wheel assemblies, suspension and brake gear, gear boxes, couplers, pantographs and heating/air conditioning equipment.
- Perform all types of complicated layouts and machine setups, as well as precision machine work on lathes, milling machines, shear, wheel lathe and grinders.
- Perform all manner of mechanical and body repair of rail car bodies and components. *not in Specification*
- Perform periodic inspections and preventive maintenance on mechanical systems and components, and properly maintain records of same.
- Be able to make emergency repairs necessary to safely move a disabled rail car or train with minimum delay.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.

Mechanic "A" - Mechanical Utility (Cont'd)

Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a high school graduate or have an equivalent combination of education and experience.
- Must have and be able to demonstrate an understanding of machine shop* practice, and repair and welding techniques.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must have a satisfactory prior work record.
- Must be able to express ideas effectively, both orally and in writing.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: SHOP HELPER WITH TOOLS

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of all types of minor maintenance operations and procedures normally done in the department at any location connected with the operation of the Company's rail system. It consists of visual and manipulative checking of parts and equipment; repairing and replacing unserviceable parts and equipment; possessing and properly using common shop tools as specified by the Company; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Use common shop tools to perform minor repairs and replacements of rail car components as directed.
- Assist rail shop mechanics as directed.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Possess and maintain a valid New York Class 2 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a high school graduate or have an equivalent combination of education and experience.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: SHOP HELPER WITHOUT TOOLS

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of general labor classification-type work. It consists of cleaning rail and automotive vehicles; preparing such vehicles for service; checking the cleanliness and serviceability of vehicles, operating rail vehicles not-in-service within the shop and yard, and on the main line if necessary; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property

RESPONSIBILITIES:

- Perform all manner of general labor classification-type work, including but not limited to vehicle cleaning, and shop/yard/office janitorial work.
- Operate not-in-service rail and other vehicles as required for cleaning, shop procedures, and the maintenance of service.
- Collect, remove and properly dispose of waste material.
- Perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved
- Possess and maintain a valid New York Class 2 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a high school graduate or have an equivalent combination of education and experience.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of activities relative to the routine handling of office business. It consists of receiving, examining, sorting, collating and distributing records and reports; organizing and maintaining records and reports; performing office procedures; issuing and receiving materials, tools and supplies; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Prepare and maintain payroll records, and investigate shortages or overages, bookkeeping errors, and other irregularities.
- Prepare requisitions, orders, receipts, accounts and comparable forms, and check manifests against requisitions when materials are delivered.
- Maintain files and records.
- Maintain inventories of materials and equipment, and issue and receive materials, tools and supplies at the storeroom.
- Issue and record employee transportation tickets.
- Operate common office machines and equipment consistent with practical standards of speed and accuracy.
- Assist working associates in routine departmental procedures.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications, and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a high school graduate or have an equivalent combination of education and experience.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: WAY AND POWER SUPERINTENDENT

GENERAL STATEMENT OF DUTIES: The job involves overall responsibility for way and power maintenance functions, including service and repair of train control, communications, and traction power systems and equipment; building and structure maintenance; and personnel administration. It consists of overseeing department operation; issuing orders and procedures; making real-time decisions on the handling of emergencies and other unusual conditions; taking proper action when unsafe or irregular acts or conditions are observed or reported; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property. Work is performed with wide latitude for independent judgment and action.

RESPONSIBILITIES:

- Accept responsibility for the operation of the Maintenance Department on any shift, at any time, when so directed by the Vice President of Maintenance and Equipment.
- Plan, coordinate and direct the work of subordinate supervisors and employees engaged in the inspection, test, repair, overhaul and replacement of train control, communications and traction power systems, and of all buildings, structures and track.
- Advise subordinates on difficult or unusual problems or repairs.
- Handle union grievances.
- Inspect and test way and power plant and equipment to verify that it is being properly used and maintained in accordance with applicable operational and safety regulations.
- Instruct personnel in approved work practices and procedures.
- Maintain an adequate inventory of parts and supplies, update parts books and price lists, prepare and maintain records, and prepare reports.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Establish shop and field operating policies and procedures.
- Direct or assist in all manner of emergency repairs necessary to correct problems or eliminate hazards arising from improper conditions in way and power plant or equipment.
- Develop a knowledge of Company policies pertaining to the work involved.

DESIRABLE KNOWLEDGE, ABILITIES, SKILLS, EDUCATION AND EXPERIENCE:

- College degree in Electrical or Mechanical Engineering, with extensive work experience in the theory, practice and management of train control, communications, traction power, building, structure and track maintenance and repair, or an equivalent combination of education and experience.

Way and Power Superintendent (Cont'd)

- Thorough knowledge of applicable governmental regulations.
- Thorough knowledge of the techniques commonly employed in the repair and servicing of way and power plant and equipment.
- Thorough knowledge of the hazards and required safety precautions of the trade, including those associated with high voltage electricity.
- Ability to plan and supervise the work of subordinates, and to make efficient use of labor and materials.
- Satisfactory prior work record.
- Ability to instruct students effectively.
- Ability to express ideas effectively, both orally and in writing.
- Ability to maintain an effective working relationship with other employees.
- Ability to interface with the public and outside agencies courteously and effectively.

CLASS TITLE: POWER DISTRIBUTION SUPERVISOR

GENERAL STATEMENT OF DUTIES: The job involves the supervision of skilled, semi-skilled and unskilled subordinates who repair and service the rail system's power conversion and distribution equipment. It consists of assuring the availability of qualified personnel to fill scheduled and unscheduled needs; verifying that employees are fit for duty and qualified to perform the work assigned; administering discipline; taking proper action when unsafe or irregular acts or conditions are observed or reported; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Accept responsibility for the operation of the department on any shift, at any time, when so directed by the Way and Power Superintendent.
- Plan activities, assign work, and supervise a staff of power distribution employees engaged in the inspection, test, repair, overhaul and replacement of transformers, rectifiers, circuit breakers, power distribution cables and switches, control apparatus, and the catenary system.
- Diagnose complex electrical malfunctions; interpret blueprints, wiring diagrams and maintenance manuals; and advise subordinates on difficult or unusual problems or repairs.
- Inspect and test power conversion and distribution equipment to verify that it is being properly used and maintained in accordance with applicable operational and safety regulations.
- Maintain an adequate inventory of parts and supplies, update parts books and price lists, prepare and maintain records, and prepare reports
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Direct or assist in all manner of emergency repairs necessary to correct problems or eliminate hazards arising from improper conditions in the power distribution system.

DESIRABLE KNOWLEDGE, ABILITIES, SKILLS, EDUCATION AND EXPERIENCE:

- College degree in a technical field, preferably Electrical Engineering, and a minimum of three years work experience in rail transit, railroad or heavy industrial applications of high voltage D.C. power, or an equivalent combination of education and experience.
- Thorough knowledge of repair and servicing techniques associated with substation equipment, power distribution systems, and related apparatus
- Thorough knowledge of the hazards and required safety precautions associated with 600 volt D.C. and 23,000 volt A.C. power systems.

Power Distribution Supervisor (Cont'd)

- Ability to plan and supervise the work of subordinates, and to make efficient use of labor and materials.
- Satisfactory prior work record.
- Ability to instruct students effectively.
- Ability to express ideas effectively, both orally and in writing.
- Ability to maintain an effective working relationship with other employees.
- Ability to interface with the public and outside agencies courteously and effectively.

CLASS TITLE: TRAIN CONTROL SUPERVISOR

GENERAL STATEMENT OF DUTIES: The job involves the supervision of skilled, semi-skilled and unskilled subordinates who repair and service the rail line's train control system. It consists of insuring the availability of qualified personnel to fill scheduled and unscheduled needs; verifying that employees are fit for duty and qualified to perform the work assigned; administering discipline; taking proper action when unsafe or irregular acts or conditions are observed or reported; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Accept responsibility for the operation of the department on any shift, at any time, when so directed by the Way and Power Superintendent.
- Plan activities, assign work, and supervise a staff of train control employees engaged in the inspection, test, repair, overhaul and replacement of wayside signals, cab signals, wiring systems, track circuits, Operations Control Center equipment, and components of all such systems.
- Diagnose complex electrical and electronic malfunctions; interpret blueprints, wiring diagrams and maintenance manuals; and advise subordinates on difficult or unusual problems or repairs.
- Inspect and test train control equipment to verify that it is being properly used and maintained in accordance with applicable operational and safety regulations.
- Maintain an adequate inventory of parts and supplies, update parts books and price lists, prepare and maintain records, and prepare report
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Direct or assist in all manner of emergency repairs necessary to correct problems or eliminate hazards arising from improper conditions in the train control system.
- Develop a knowledge of Company policies pertaining to the work involved.

DESIRABLE KNOWLEDGE, ABILITIES, SKILLS, EDUCATION AND EXPERIENCE:

- College degree in a technical field, preferably Electrical Engineering and a minimum of three years work experience in railroad or rail transit train control systems, or an equivalent combination of education and experience.
- Thorough knowledge of the techniques commonly employed in the repair and servicing of complex train control equipment.
- Thorough knowledge of the hazards and required safety precautions of the trade.
- Ability to plan and supervise the work of subordinates, and to make use of labor and materials.

Train Control Supervisor (Cont'd)

- o Satisfactory prior work record.
- o Ability to instruct students effectively.
- o Ability to express ideas effectively, both orally and in writing.
- o Ability to maintain an effective working relationship with other employees.
- o Ability to interface with the public and outside agencies courteously and effectively.

CLASS TITLE: COMMUNICATIONS SUPERVISOR

GENERAL STATEMENT OF DUTIES: The job involves the supervision of skilled, semi-skilled and unskilled subordinates who repair and service the rail system's communications plant and equipment. It consists of insuring the availability of qualified personnel to fill scheduled and unscheduled needs; verifying that employees are fit for duty and qualified to perform the work assigned; administering discipline; taking proper action when unsafe or irregular acts or conditions are observed or reported; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Accept responsibility for the operation of the department on any shift, at any time, when so directed by the Way and Power Superintendent.
- Plan activities, assign work, and supervise a staff of communications employees engaged in the inspection, test, repair, overhaul and replacement of data transmission systems; UHF radio transmitters, receivers, repeaters, antennas and associated equipment, emergency and administrative telephone systems; closed circuit television and voice intercom systems; Operations Control Center equipment, and components of all such systems.
- Diagnose complex electrical and electronic malfunctions; interpret blueprints, wiring diagrams and maintenance manuals; and advise subordinates on difficult or unusual problems or repairs.
- Inspect and test communications equipment to verify that it is being properly used and maintained in accordance with applicable operational and safety regulations.
- Maintain an adequate inventory of parts and supplies, update parts books and price lists, prepare and maintain records, and prepare reports
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Direct or assist in all manner of emergency repairs necessary to correct problems or eliminate hazards arising from improper conditions in the communications system.
- Develop a knowledge of Company policies pertaining to the work involved

DESIRABLE KNOWLEDGE, ABILITIES, SKILLS, EDUCATION AND EXPERIENCE:

- Collegé degree in a technical field, preferably Electrical Engineering, and a minimum of three years of work experience in the communications industry, or an equivalent combination of education and experience.
- Thorough knowledge of the techniques commonly employed in the repair and servicing of complex communications equipment.
- Thorough knowledge of the hazards and required safety precautions of the trade.
- Ability to plan and supervise the work of subordinates, and to make efficient use of labor and materials.

Communications Supervisor (Cont'd)

- Satisfactory prior work record.
- Ability to instruct students effectively.
- Ability to express ideas effectively, both orally and in writing.
- Ability to maintain an effective working relationship with other employees.
- Ability to interface with the public and outside agencies courteously and effectively.

CLASS TITLE: WAY AND STRUCTURE SUPERVISOR

GENERAL STATEMENT OF DUTIES: The job involves the supervision of skilled, semi-skilled and unskilled subordinates who repair and service the rail system's track, buildings and other structural facilities. It consists of insuring the availability of qualified personnel to fill scheduled and unscheduled needs; verifying that employees are fit for duty and qualified to perform the work assigned; administering discipline; taking proper action when unsafe or irregular acts or conditions are observed or reported; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Accept responsibility for the operation of the department on any shift, at any time, when so directed by the Way and Power Superintendent.
- Plan activities, assign work, and supervise a staff of way and structure employees engaged in the inspection, test, repair, overhaul and replacement of track and switch components; yard, station and other buildings; tunnels; station facilities; pumps; emergency ventilation equipment; and fire fighting apparatus.
- Diagnose mechanical defects; interpret blue prints, wiring diagrams and maintenance manuals; and advise subordinates on difficult or unusual problems or repairs.
- Inspect and test way and structure plant and equipment to verify that it is being properly used and maintained in accordance with applicable operational and safety regulations.
- Maintain an adequate inventory of parts and supplies, update parts books and price lists, prepare and maintain records, and prepare report
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Direct or assist in all manner of emergency repairs necessary to correct problems or eliminate hazards arising from improper conditions in way and structure plant or equipment.
- Develop a knowledge of Company policies pertaining to the work involved

DESIRABLE KNOWLEDGE, ABILITIES, SKILLS, EDUCATION AND EXPERIENCE:

- College degree in a technical field, preferably Mechanical or Civil Engineering, and a minimum of three years work experience in the rail transit or railroad industry, or an equivalent combination of education and experience.
- Thorough knowledge of the techniques commonly employed in the repair and servicing of way and structure plant and equipment.
- Thorough knowledge of the hazards and required safety precautions of the trade.

Way and Structure Supervisor (Cont'd)

- Ability to plan and supervise the work of subordinates, and to make efficient use of labor and materials.
- Satisfactory prior work record.
- Ability to instruct students effectively.
- Ability to express ideas effectively, both orally and in writing.
- Ability to maintain an effective working relationship with other employees.
- Ability to interface with the public and outside agencies courteously and effectively.

CLASS TITLE: WAY AND POWER RELIEF SUPERVISOR

GENERAL STATEMENT OF DUTIES: The job involves the supervision of skilled, semi-skilled and unskilled subordinates who repair and service all equipment and structures maintained by the Way and Power Department. It consists of insuring the availability of qualified personnel to fill scheduled and unscheduled needs; verifying that employees are fit for duty and qualified to perform the work assigned; administering discipline; taking proper action when unsafe or irregular acts or conditions are observed or reported; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Accept responsibility for the operation of the department or any of its sections on any shift, at any time, when so directed by the Way and Power Superintendent.
- Plan activities, assign work, and supervise a staff of way and power employees engaged in the inspection, test, repair, overhaul and replacement of communications, train control, traction power, fare collection, buildings, track and structures equipment and systems.
- Diagnose complex electrical and electronic malfunctions; interpret blueprints, wiring diagrams and maintenance manuals; and advise subordinates on difficult or unusual problems or repairs.
- Inspect and test way and power equipment to verify that it is being properly used and maintained in accordance with applicable operational and safety regulations.
- Maintain an adequate inventory of parts and supplies, update parts books and price lists, prepare and maintain records, and prepare reports.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Direct or assist in all manner of emergency repairs necessary to correct problems or eliminate hazards arising from improper conditions in way and power systems.
- Develop a knowledge of Company policies pertaining to the work involved.

DESIRABLE KNOWLEDGE, ABILITIES, SKILLS, EDUCATION AND EXPERIENCE:

- College degree in a technical field, preferably Electrical or Mechanical Engineering, and a minimum of three years of work experience in way and power activities in the rail transit or railroad industry, or an equivalent combination of education and experience.
- Thorough knowledge of the methods, practices, materials and tools commonly used in way and power maintenance.
- Thorough knowledge of the hazards and required safety precautions of the trade, including those associated with high voltage A.C. and D.C. power lines and equipment.

Way and Power Relief Supervisor (Cont'd)

- Ability to plan and supervise the work of subordinates, and to make efficient use of labor and materials.
- Satisfactory prior work record.
- Ability to instruct students effectively.
- Ability to express ideas effectively, both orally and in writing.
- Ability to maintain an effective working relationship with other employees.
- Ability to interface with the public and outside agencies courteously and effectively.

CLASS TITLE: POWER DISTRIBUTION LEADER

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blueprints and wiring diagrams; analyzing defects in substations, transmission and power return circuits, and catenary equipment, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Accept responsibility for the operation of the section at any time when so directed by the Power Distribution Supervisor.
- Assign work duties and supervise subordinates to insure that work is performed correctly, completely, and in a timely fashion.
- Discover defective, unserviceable or deteriorating conditions in power distribution systems, units or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand the principles of 23,000-volt alternating and 650-volt direct current power conversion and distribution, and safety precautions regarding work on power systems.
- Understand and be proficient in the use of complex electrical monitoring and test equipment, including but not limited to ammeters, ohmmeters, and voltmeters.
- Test, repair or replace power distribution systems or components, included but not limited to high-voltage solid state rectifiers, transformers, circuit breakers, insulators, and switchgear; remotely located power control equipment; constant and variable tension catenary suspension systems; feeder cable; and substation batteries and charging systems.
- Test, troubleshoot and repair defects in complex power distribution wiring and cabling systems.
- Perform periodic inspections and preventive maintenance on power distribution systems and components, and properly maintain records of same.
- Be able to make emergency repairs to substations, transmission circuits and catenary equipment in order to maintain train service with a minimum of delay.
- Perform all of the work assigned as duties for any job in subordinate or comparable classifications, and perform all duties with a speed and accuracy satisfactory to Company management.

Power Distribution Leader (Cont'd)

- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a journeyman electrician with four years work experience in the area of high-voltage alternating and direct current power conversion and distribution systems.
- Must be able to demonstrate a high level of skill in reading cable diagrams, wiring diagrams, and schematics.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: CATENARY-SUBSTATION SPECIALIST

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blueprints and wiring diagrams; analyzing defects in substations, transmission and power return circuits, and catenary equipment, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Discover defective, unserviceable or deteriorating conditions in power distribution systems, units or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand the principles of 23,000-volt alternating and 650-volt direct current power conversion and distribution, and safety precautions regarding work on power systems.
- Understand and be proficient in the use of complex electrical monitoring and test equipment, including but not limited to ammeters, ohmmeters, and voltmeters.
- Test, repair or replace power distribution systems or components, included but not limited to high-voltage solid state rectifiers, transformers, circuit breakers, insulators, and switchgear; remotely located power control equipment; constant and variable tension catenary suspension systems; feeder cable; and substation batteries and charging systems.
- Test, troubleshoot and repair defects in complex power distribution wiring and cabling systems.
- Perform periodic inspections and preventive maintenance on power distribution systems and components, and properly maintain records of same.
- Be able to make emergency repairs to substations, transmission circuits and catenary equipment in order to maintain train service with a minimum of delay.
- Perform all of the work assigned as duties for any job in subordinate or comparable classifications, and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.

Catenary-Substation Specialist (Cont'd)

- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a journeyman electrician with four years work experience in the area of high-voltage alternating and direct current power conversion and distribution systems, including two years of overhead line work.
- Must be able to demonstrate a high level of skill in reading cable diagrams, wiring diagrams, and schematics.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: CATENARY-SUBSTATION MECHANIC "A"

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blueprints and wiring diagrams; analyzing defects in substations, transmission and power return circuits, and catenary equipment, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Discover defective, unserviceable or deteriorating conditions in power distribution systems, units or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand the principles of 23,000-volt alternating and 650-volt direct current power conversion and distribution, and safety precautions regarding work on power systems.
- Understand and be proficient in the use of complex electrical monitoring and test equipment, including but not limited to ammeters, ohmmeters, and voltmeters.
- Test, repair or replace power distribution systems or components, included but not limited to high-voltage solid state rectifiers, transformers, circuit breakers, insulators, and switchgear; remotely located power control equipment; constant and variable tension catenary suspension systems; feeder cable; and substation batteries and charging systems.
- Test, troubleshoot and repair defects in complex power distribution wiring and cabling systems.
- Perform periodic inspections and preventive maintenance on power distribution systems and components, and properly maintain records of same.
- Be able to make emergency repairs to substations, transmission circuit and catenary equipment in order to maintain train service with a minimum of delay.
- Perform all of the work assigned as duties for any job in subordinate or comparable classifications, and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.

Catenary-Substation Mechanic "A" (Cont'd)

- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a journeyman electrician with four years work experience in the area of high-voltage alternating and direct current power conversion and distribution systems, including two years of overhead line work.
- Must be able to demonstrate a high level of skill in reading cable diagrams, wiring diagrams, and schematics.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: TRAIN CONTROL LEADER

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blue prints and wiring diagrams; analyzing defects in vehicle, wayside and Operations Control Center train control equipment, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Accept responsibility for the operation of the section on any shift at any time when so directed by the Train Control Supervisor.
- Assign work duties and supervise subordinates to insure that work is performed correctly, completely, and in a timely fashion.
- Discover defective, unserviceable or deteriorating conditions in train control systems, units or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand the principles of block signalling, relays, track circuits, interlockings, traffic control, cab signalling, time and route locking, etc., and safety precautions regarding work on same.
- Test, repair or replace train control systems, components or parts.
- Test, troubleshoot and repair defects in complex train control wiring systems.
- Perform periodic inspections and preventive maintenance on train control systems and components, and properly maintain records of same.
- Be able to make emergency repairs to vehicle, wayside, or OCC train control equipment in order to maintain train service with a minimum of delay.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.

- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must have two years of formal training in advanced electrical/electronic theory, including digital logic, analog integrated circuitry, relay logic, and CRT circuitry, and two years experience in railroad/rail transit signalling and train control systems, or five years experience in the maintenance, troubleshooting and repair of railroad/rail transit signalling and train control systems.
- Must be able to demonstrate a high level of skill in reading cable diagrams, wiring diagrams, logic circuits, and schematics.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: TRAIN CONTROL SPECIALIST

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blue prints and wiring diagrams; analyzing defects in vehicle, wayside and Operations Control Center train control equipment, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Discover defective, unserviceable or deteriorating conditions in train control systems, units or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand the principles of block signalling, relays; track circuits, interlockings, traffic control, cab signalling, time and route locking, etc., and safety precautions regarding work on same.
- Test, repair or replace train control systems, components or parts.
- Test, troubleshoot and repair defects in complex train control wiring systems.
- Perform periodic inspections and preventive maintenance on train control systems and components, and properly maintain records of same.
- Be able to make emergency repairs to vehicle, wayside, or OCC train control equipment in order to maintain train service with a minimum of delay.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods, and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must have two years of formal training in advanced electrical/electronic theory, including digital logic, analog integrated circuitry, relay logic, and CRT circuitry, and one year experience in railroad/rail transit signalling and train control systems, or three years experience in the maintenance, troubleshooting and repair of railroad/rail transit signalling and train control systems.
- Must be able to demonstrate a high level of skill in reading cable diagrams, wiring diagrams, logic circuits, and schematics.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: TRAIN CONTROL MECHANIC "A"

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blueprints and wiring diagrams; analyzing defects in vehicle, wayside and Operations Control Center train control equipment, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties, and the protecting of Company property.

RESPONSIBILITIES:

- Discover defective, unserviceable or deteriorating conditions in train control systems, units or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand the principles of block signalling, relays, track circuits, interlockings, traffic control, cab signalling, time and route locking, etc., and safety precautions regarding work on same.
- Test, repair or replace train control systems, components or parts.
- Test, troubleshoot and repair defects in complex train control wiring systems.
- Perform periodic inspections and preventive maintenance on train control systems and components, and properly maintain records of same.
- Be able to make emergency repairs to vehicle, wayside, or OCC train control equipment in order to maintain train service with a minimum of delay.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods, and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- o Must have one year of formal training in electrical/electronic theory, electronic symbolism, and circuit tracing, plus two years of on-the-job experience; or, a three year work record in industrial/commercial electronic equipment, with emphasis on solid state and relay circuitry.
- o Must be able to demonstrate a high level of skill in reading cable diagrams, wiring diagrams, logic circuits and schematics.
- o Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- o Must be able to express ideas effectively, both orally and in writing.
- o Must have a satisfactory prior work record.
- o Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: COMMUNICATIONS LEADER

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blueprints and wiring diagrams; analyzing defects in vehicle, wayside, yard and shop, and Operations Control Center communications systems, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Accept responsibility for the operation of the section on any shift at any time when so directed by the Communications Supervisor.
- Assign work duties and supervise subordinates to insure that work is performed correctly, completely, and in a timely fashion.
- Discover defective, unserviceable or deteriorating conditions in communications systems, units, or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand the principles, methods and procedures applicable to UHF radio, telephone, closed circuit television, intercom, T-carrier communications systems, and safety precautions regarding work on same.
- Understand and be proficient in the use of complex electrical test equipment, including but not limited to oscilloscopes, ammeters, ohmmeters, voltmeters, and ultrasonic detection devices.
- Test, repair or replace vehicle, wayside, yard and shop, and OCC communications systems or components, including but not limited to UHF radio transmitters, receivers, repeaters and antenna cables; administrative and emergency telephone systems; closed circuit television cameras, transmission and control equipment, and monitors; Supervisory Control And Data Acquisition (SCADA) wiring and devices; area paging and talk-back receivers, transmitters, speakers, and wiring; audio logging devices; station public address and intercom systems; and T-carrier and data transmission networks.
- Test, troubleshoot and repair defects in complex communications wiring systems.
- Perform periodic inspections and preventive maintenance on communications systems and components, and properly maintain records of same.
- Be able to make emergency repairs to vehicle, wayside, or OCC communications equipment in order to maintain train service with a minimum of delay.

Communications Leader (Cont'd)

- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications, and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must have two years of formal training in advanced electrical/electron theory, including digital logic, analog integrated circuitry, and CRT circuitry, and two years experience in the maintenance, troubleshooting and repair of modern communications systems.
- Must be able to demonstrate a high level of skill in reading cable diagrams, wiring diagrams, logic circuits, and schematics.
- Must possess and maintain a valid FCC Second-Class Radio-Telephone Operator's License.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: COMMUNICATIONS SPECIALIST

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blueprints and wiring diagrams; analyzing defects in vehicle, wayside, yard and shop, and Operations Control Center communications systems, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Discover defective, unserviceable or deteriorating conditions in communications systems, units, or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand the principles, methods and procedures applicable to UHF radio, telephone, closed circuit television, intercom, T-carrier communications systems, and safety precautions regarding work on same.
- Understand and be proficient in the use of complex electrical test equipment, including but not limited to oscilloscopes, ammeters, ohmmeters, voltmeters, and ultrasonic detection devices.
- Test, repair or replace vehicle, wayside, yard and shop, and OCC communications systems or components, including but not limited to UHF radio transmitters, receivers, repeaters and antenna cables; administrative and emergency telephone systems; closed circuit television cameras, transmission and control equipment, and monitors; Supervisory Control And Data Acquisition (SCADA) wiring and devices; area paging and talk-back receivers, transmitters, speakers, and wiring; audio logging devices; station public address and intercom systems; and T-carrier and data transmission networks.
- Test, troubleshoot and repair defects in complex communications wiring systems.
- Perform periodic inspections and preventive maintenance on communications systems and components, and properly maintain records of same.
- Be able to make emergency repairs to vehicle, wayside, or OCC communications equipment in order to maintain train service with a minimum of delay.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications, and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.

Communications Specialist (Cont'd)

- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must have two years of formal training in advanced electrical/electronic theory, including digital logic, analog integrated circuitry, and CRT circuitry, and two years experience in the maintenance, troubleshooting and repair of modern communications systems.
- Must be able to demonstrate a high level of skill in reading cable diagrams, wiring diagrams, logic circuits, and schematics.
- Must possess and maintain a valid FCC Third-Class radio-Telephone Operator's license, and must within a period of sixty (60) days obtain and maintain a valid FCC Second-Class Radio-Telephone Operator's License.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: COMMUNICATIONS MECHANIC "A"

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blueprints and wiring diagrams; analyzing defects in vehicle, wayside, yard and shop, and Operations Control Center communications systems, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Discover defective, unserviceable or deteriorating conditions in communications systems, units, or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand the principles, methods and procedures applicable to UHF radio, telephone, closed circuit television, intercom, T-carrier communications systems, and safety precautions regarding work on same.
- Understand and be proficient in the use of complex electrical test equipment, including but not limited to oscilloscopes, ammeters, ohmmeters, voltmeters, and ultrasonic detection devices.
- Test, repair or replace vehicle, wayside, yard and shop, and OCC communications systems or components, including but not limited to UHF radio transmitters, receivers, repeaters and antenna cables; administrative and emergency telephone systems; closed circuit television cameras, transmission and control equipment, and monitors; Supervisory Control And Data Acquisition (SCADA) wiring and devices; area paging and talk-back receivers, transmitters, speakers, and wiring; audio logging devices; station public address and intercom systems; and T-carrier and data transmission networks.
- Test, troubleshoot and repair defects in complex communications wiring systems.
- Perform periodic inspections and preventive maintenance on communications systems and components, and properly maintain records of same.
- Be able to make emergency repairs to vehicle, wayside, or OCC communications equipment in order to maintain train service with a minimum of delay.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications, and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.

Communications Mechanic "A" (Cont'd)

- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 drivers license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must have one year of formal training in electrical/electronic theory, electronic symbolism, and circuit tracing, plus two years experience in the maintenance, troubleshooting and repair of complex electronic and/or communications systems.
- Must be able to demonstrate a high level of skill in reading cable diagrams, wiring diagrams, logic circuits, and schematics.
- Must possess and maintain a valid FCC Third-Class Radio-Telephone Operator's License, and must within a period of sixty (60) days obtain and maintain a valid FCC Second-Class Radio-Telephone Operator's License.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: WAY AND STRUCTURE LEADER

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting blueprints; applying building maintenance, carpentry, masonry and track repair skills; analyzing defects in track and structures; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Accept responsibility for the operation of the section on any shift at any time when so directed by the Way and Structure Supervisor.
- Assign work duties and supervise subordinates to insure that work is performed correctly, completely, and in a timely fashion.
- Discover defective, unserviceable or deteriorating conditions in track, tunnel or building structures, mechanisms or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand and apply accepted principles of track maintenance, and safety precautions regarding same; be knowledgeable about the use of track maintenance tools such as benders, saws, jacks, etc.
- Repair or construct brick, concrete or concrete block walls, floors, sidewalks or driveways.
- Repair, replace or construct interior dividers, roofs, door and window frames, sheet metal work, plate glass or plastic windows or panels, etc.
- Perform periodic inspections and preventive maintenance on track, tunnel ventilation equipment and buildings, and properly maintain records of same.
- Perform all required acetylene burning, gas, arc and heliarc welding.
- Be able to make emergency repairs to stations, buildings, tunnels, and tunnel equipment in order to maintain service to the public with a minimum of delay and inconvenience.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications, and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.

Way and Structure Leader (Cont'd)

- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a high school graduate, or have an equivalent combination of education and experience.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting blueprints; applying building maintenance, carpentry, masonry and track repair skills; analyzing defects in track and structures; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Discover defective, unserviceable or deteriorating conditions in track, tunnel or building structures, mechanisms or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand and apply accepted principles of track maintenance, and safety precautions regarding same; be knowledgeable about the use of track maintenance tools such as benders, saws, jacks, etc.
- Repair or construct brick, concrete or concrete block walls, floors, sidewalks or driveways.
- Repair, replace or construct interior dividers, roofs, door and window frames, sheet metal work, plate glass or plastic windows or panels, etc.
- Perform periodic inspections and preventive maintenance on track, tunnel ventilation equipment and buildings, and properly maintain records of same.
- Perform all required acetylene burning, gas, arc and heliarc welding.
- Be able to make emergency repairs to stations, buildings, tunnels, and tunnel equipment in order to maintain service to the public with a minimum of delay and inconvenience.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications, and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision:

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a high school graduate, or have an equivalent combination of education and experience.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting blueprints; applying building maintenance, carpentry, masonry and track repair skills; analyzing defects in track and structures; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Discover defective, unserviceable or deteriorating conditions in track, tunnel or building structures, mechanisms or parts; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Fully understand and apply accepted principles of track maintenance, and safety precautions regarding same; be knowledgeable about the use of track maintenance tools such as benders, saws, jacks, etc.
- Repair or construct brick, concrete or concrete block walls, floors, sidewalks or driveways.
- Repair, replace or construct interior dividers, roofs, door and window frames, sheet metal work, plate glass or plastic windows or panels, etc.
- Perform periodic inspections and preventive maintenance on track, tunnel, ventilation equipment and buildings, and properly maintain records of same.
- Perform all required acetylene burning, gas, arc and heliarc welding.
- Be able to make emergency repairs to stations, buildings, tunnels, and tunnel equipment in order to maintain service to the public with a minimum of delay and inconvenience.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications, and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision:

CLASS TITLE: FARE COLLECTION LEADER

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blueprints and wiring diagrams; analyzing defects in fare collection equipment, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Accept responsibility for the operation of the section on any shift at any time when so directed by department supervision.
- Assign work duties and supervise subordinates to insure that work is performed correctly, completely, and in a timely fashion.
- Read and correctly interpret blueprints, instruction sheets and manuals, and wiring diagrams.
- Discover defective, unserviceable or deteriorating conditions in fare collection equipment; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Understand and be proficient in the use of complex electrical test equipment, including but not limited to ammeters, ohmmeters and voltmeters.
- Test, repair or replace fare collection equipment, parts and mechanisms, including but not limited to printed circuit boards, controls, display modules, power panels, transformers, alarms, locks, bill validators, coin acceptors, printers, bill stackers, microprocessors, etc.
- Test, troubleshoot and repair defects in complex fare collection equipment wiring systems.
- Perform periodic inspections and preventive maintenance on communications systems and components, and properly maintain records of same.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications, and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.

- Possess and maintain a valid New York Class 2 and 3 driver's license.

Perform other duties and tasks not stated above but which become part this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must have two years of formal training in electrical/electronic theory, microprocessor experience, and three years experience in troubleshooting printed circuit boards to component level.
- Must be able to demonstrate a high level of skill in reading cable diagrams, wiring diagrams, logic circuits, and schematics.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: FARE COLLECTION SPECIALIST

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in the department at any location connected with the operation of the company's rail system. It consists of reading and interpreting instruction sheets, blueprints and wiring diagrams; analyzing defects in fare collection equipment, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Read and correctly interpret blueprints, instruction sheets and manuals, and wiring diagrams.
- Discover defective, unserviceable or deteriorating conditions in fare collection equipment; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Understand and be proficient in the use of complex electrical test equipment, including but not limited to ammeters, ohmmeters and voltmeters.
- Test, repair or replace fare collection equipment, parts and mechanisms, including but not limited to printed circuit boards, controls, display modules, power panels, transformers, alarms, locks, bill validators, coin acceptors, printers, bill stackers, microprocessors, etc.
- Test, troubleshoot and repair defects in complex fare collection equipment wiring systems.
- Perform periodic inspections and preventive maintenance on communications systems and components, and properly maintain records of same.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications, and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

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BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must have two years of formal training in electrical/electronic theory, microprocessor experience, and three years experience in troubleshooting printed circuit boards to component level.
- Must be able to demonstrate a high level of skill in reading cable diagrams, wiring diagrams, logic circuits, and schematics.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: FARE COLLECTION MECHANIC "A"

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of any type of assigned work normally done in department at any location connected with the operation of the Company's rail system. It consists of reading and interpreting instruction sheets, blueprints and wiring diagrams; analyzing defects in fare collection equipment, parts and mechanisms; setting up equipment for and conducting tests; making repairs, replacements and adjustments with a minimum of direct supervision; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

- Read and correctly interpret blueprints, instruction sheets and manuals, and wiring diagrams.
- Discover defective, unserviceable or deteriorating conditions in fare collection equipment; diagnose the cause of such conditions; and determine the extent of required adjustments, repairs and/or replacements.
- Understand and be proficient in the use of complex electrical test equipment, including but not limited to ammeters, ohmmeters and voltmeters.

Test, repair or replace fare collection equipment, parts and mechanisms, including but not limited to printed circuit boards, controls, display modules, power panels, transformers, alarms, locks, bill validators, coin acceptors, printers, bill stackers, microprocessors, etc.

- Test, troubleshoot and repair defects in complex fare collection equipment wiring systems.
- Perform periodic inspections and preventive maintenance on communications systems and components, and properly maintain records of same.
- Perform all of the work assigned as duties for any jobs in subordinate or comparable classifications, and perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Explain, instruct and demonstrate to others all job details, methods and procedures when directed to do so by department supervision.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

12.13.83

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a high school graduate and have three years of maintenance experience in the electronics industry or with electronic equipment.
- Must be able to demonstrate a high level of skill in reading cable diagrams, wiring diagrams, logic circuits, and schematics.
- Must be able to demonstrate by oral and/or written examination that the required level of knowledge is possessed.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: WAY AND POWER HELPER WITHOUT TOOLS

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of general labor classification-type work. It consists of performing manual labor in connection with the maintenance track, buildings, wayside structures and auxiliary systems; snow shoveling; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties, and the protecting of Company property.

RESPONSIBILITIES:

- Perform all manner of general labor classification-type work, including but not limited to track repair, building maintenance, and snow shoveling.
- Collect, remove and properly dispose of waste material.
- Perform all duties with a speed and accuracy satisfactory to Company management.
- Accept instructions and work assignments required to qualify for other classifications.
- Develop a knowledge of Company policies pertaining to the work involved.
- Possess and maintain a valid New York Class 2 and 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a high school graduate or have an equivalent combination of education and experience.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

CLASS TITLE: STATION PORTER

GENERAL STATEMENT OF DUTIES: The job involves the preparation, performance and completion of general cleaning work in and around rail passenger stations. It consists of checking the cleanliness of station facilities and equipment; performing cleaning operations in the prescribed manner; observing for and reporting of unsafe or irregular conditions; exercising sound judgment relative to all aspects of assigned duties; and the protecting of Company property.

RESPONSIBILITIES:

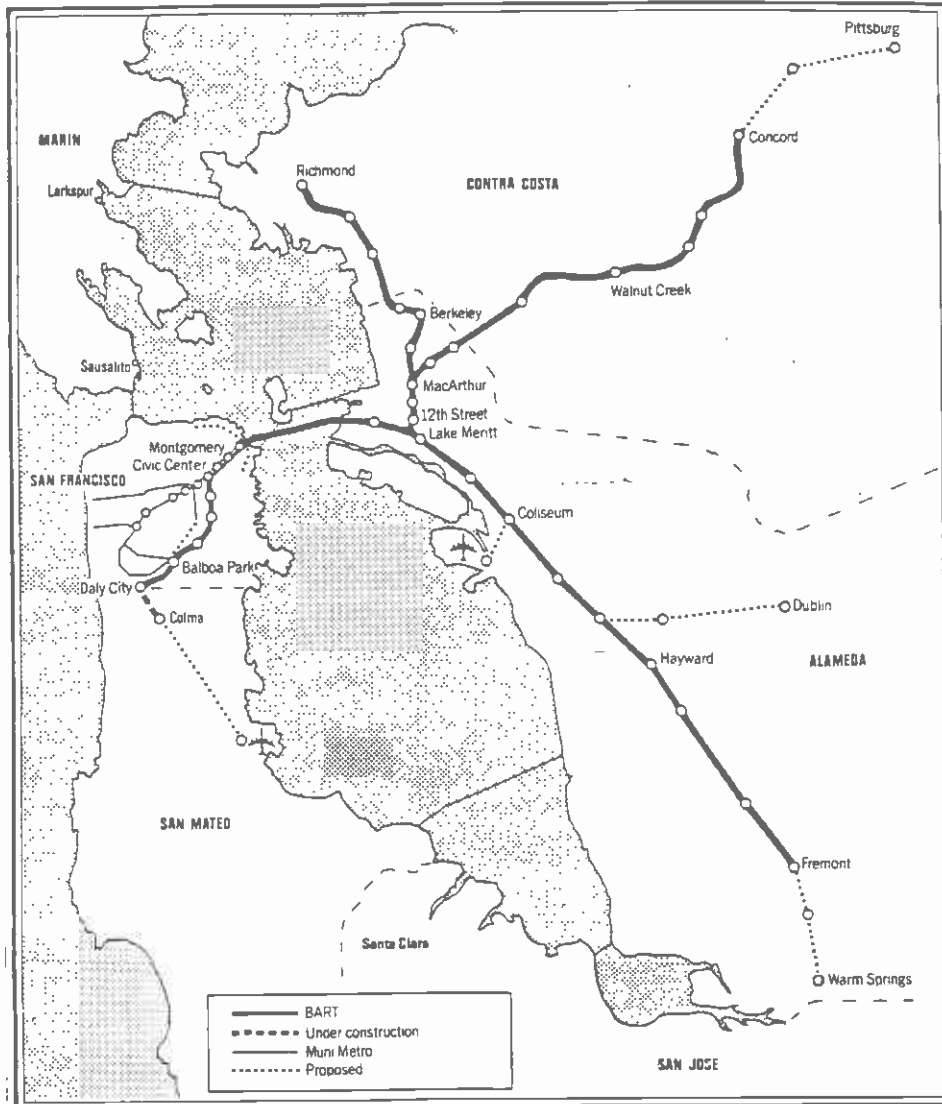
- Sweep, mop, scrub and/or wax floors, platforms, corridors and stairways at rail passenger stations.
- Clean windows, panels, artwork, railings, lighting fixtures, signs, vending machines, etc.
- Clean, supply and maintain station restrooms.
- Collect, remove and properly dispose of waste material.
- Shovel snow from station entrances and platforms.
- Perform minor housekeeping duties and order supplies.
- Drive Company vehicles to and between assigned work locations.
- Perform all duties with a speed and accuracy satisfactory to Company management.
- Develop a knowledge of Company policies pertaining to the work involved.
- Possess and maintain a valid New York Class 3 driver's license.
- Perform other duties and tasks not stated above but which become part of this or any job as directed by Company supervision.

BASIC QUALIFICATIONS REQUIRED FOR CONSIDERATION:

- Must be a high school graduate or have an equivalent combination of education and experience.
- Must be able to express ideas effectively, both orally and in writing.
- Must have a satisfactory prior work record.
- Must be able to maintain an effective working relationship with supervisors and other employees.

San Francisco Municipal Railway
Muni Metro
Light Rail System

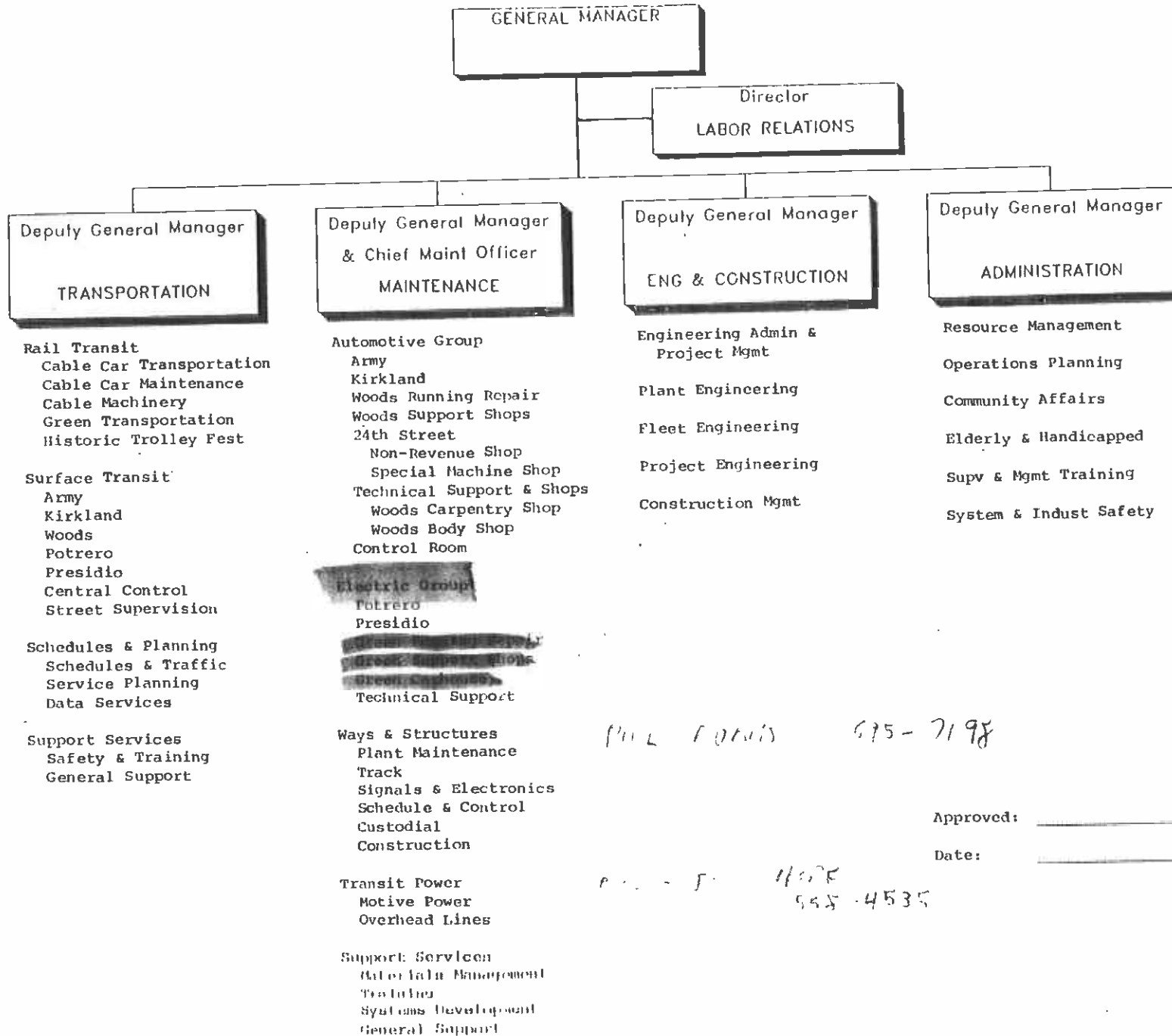
1. Number of Lines = 5
2. Total Route Miles
3. Rail Fleet Size = 130 Boeing Articulated light rail vehicles & 10 historic streetcars for limited special service
4. Annual Vehicle Miles of Service = 4,068,750 mi. (6.51 million kilometers)
5. Annual Operating Budget =
6. Annual Ridership = 38.9 million (1985/86)
7. Total Operating Staff = 707 + 11 at Public Utilities Commission (maintaining overhead wires)



BART and Muni metro

SAN FRANCISCO MUNICIPAL RAILWAY

Organization Chart



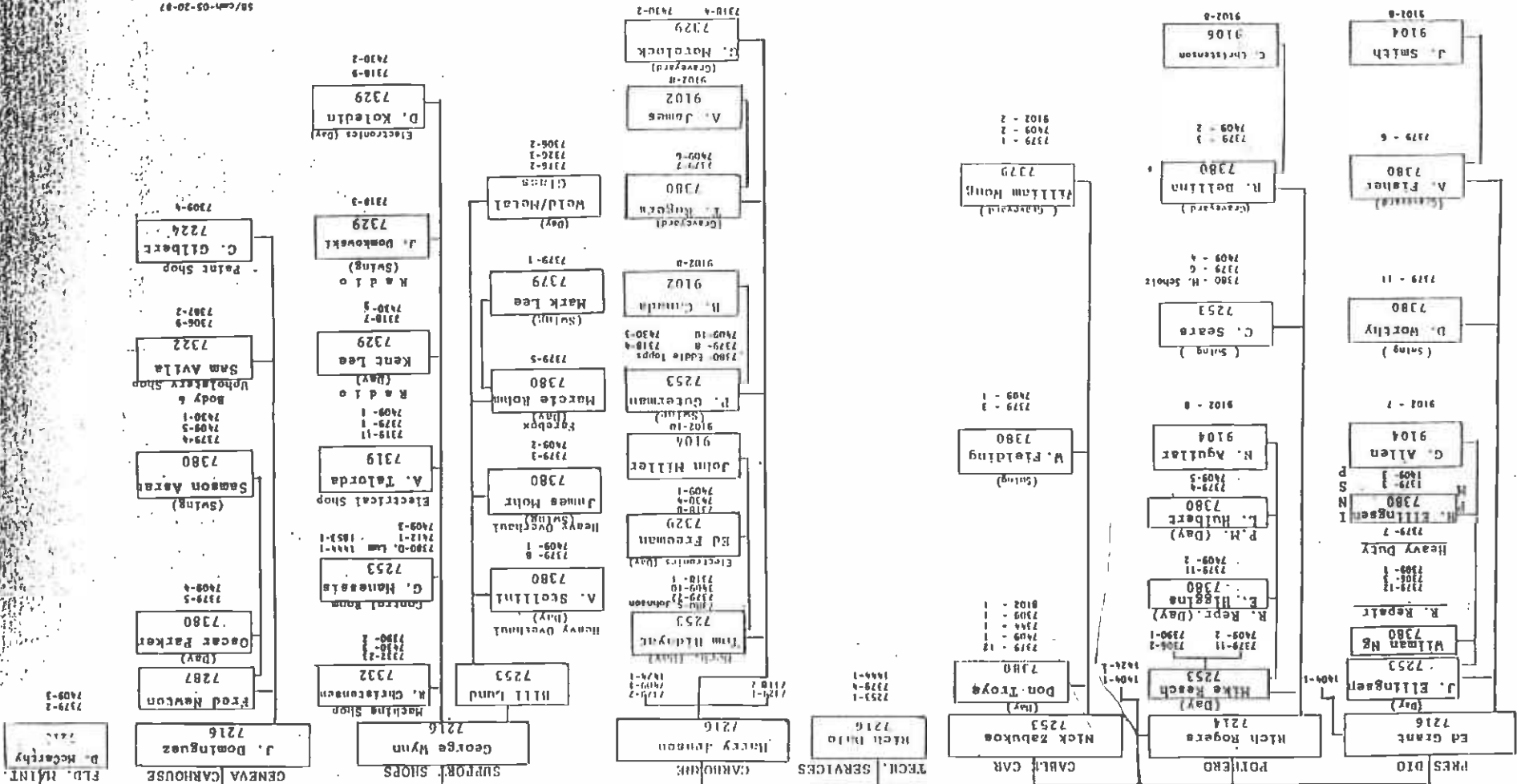
PHIL FORDIS 675-7198

PHIL FORDIS 675-4535

Approved: _____
Date: _____

BRITISH TELEPHONES

1826-1
1825-1
1824-1



Muni Light Rail Operations Staff

1	Superintendent for Rail
1	Deputy Superintendent
5	Assistant Managers
28	Supervisors
263	Operators
2	Clerical
<u>8</u>	Dispatchers
308	Total

Source: Mr. Dan Rosen (415) 337-2263
Mr. John Miller (415) 337-2281
Municipal Railroad
9/1/87

The following pages give a detailed breakdown of Muni staffing for Light Rail Vehicle Maintenance and Ways and Structures Maintenance. The vehicle maintenance positions are listed by position under the column labeled METRO. All of the positions in that column are related to Light Rail Maintenance.

Unfortunately the situation is substantially less clear with regards to Ways and Structures positions (listed on the same pages in the column labeled W & S). The workers in this Muni division provide building, yard, track and other structure maintenance for all Muni divisions including cable car, Muni Metro, Trolleybus and Diesel bus. The Ways & Structures staff did not have a readily available means of allocating staff full-time equivalent positions by division. The complexity of the situation is increased since individual workers (like carpenters) may work on office renovations at different divisions on successive days. Even rail only workers (like track workers) alternate between cable car and light rail work as needed.

The Planning Department of the Municipal Railroad suggested in a telephone call (10/13/87) that the following methodology be adopted:

1. Subtract 10% from the total Ways & Structures staff for Cable Car Maintenance.
2. Proportion the remaining 90% between Light Rail and Trolley bus based on Annual Vehicle Miles of Service. This will reflect the high maintenance requirements of the older trolleybus system.
3. Disregard the small number of Ways & Structures staff allocated to the Diesel bus.
4. Based on this method, and the 6.51 million vehicle kilometers of light rail operation and 13 million vehicle kilometers of trolleybus operation (both in 1984/85), a total of 76 Ways and Structures staff is attributable to Muni Metro.

5. This is an intuitively plausible number since it is greater than the total number of track only workers in the Ways and Structures Department.

Greg Ridner

DATE JULY 31, 1987
 PREPARED BY JIM GILLEN

MAINTENANCE POSITION CONTROL
 CRAFT

CLASS	TITLE	UNEMPLOYED	GRANT	TENTATIVE	TXD		TOTAL A TOTAL H	ALLOCATION BY DIVISION												TOTAL		COMMENTS
					TO	FR		ADMIN		AUTO		TROLLEY		METRO		W & B		A	V			
								A	V	A	V	A	V	A	V	A	V			A	V	
2708	CUSTODIAN	50					50								50	7	50	7				
2716	CUSTODIAL ASST SPV	8					8								8	1	8	1				
2718	CUSTODIAL SPV I	2					2								2		2					
2720	JANITORIAL SVCS AST SV	1					1								1		1					
3417	GARDENER	2				1	3								3		3		1 FR 3418			
3418	GARDENER ASST SPV	1			1		0										0		1 TO 3417			
7205	CHIEF STATIONARY ENGR	1					1								1		1					
7213	PLUMBER SPV I	1			1		0										0		1 TO 7348			
7215	GENERAL LABORER SPV I	1				1	2								2		2		1 FR 7355			
7216	ELEC TRANS SHOP SPV I	8		1*	1		8	1			3	1	4				8	1	1 TO 7224			
7224	CAR & AUTO PAINTER SV I	1					1						1				1					
7225	TRANSIT PAINT SHOP SV I	1					1				1						1					
7226	CARPENTER SPV I	2					2							1			2					
7228	AUTO TRANSIT SHOP SPV I	5	1	1*		1	8								8	1	8	1	1 FR 721			
7238	ELECTRICIAN SPV I	1					1								1		1					
7241	SENIOR MAINT CONTROLLER	2					2								1	1	2	1				
7242	PAINTER SPV I	1					1								1		1					
7249	AUTO MECH SPV I	9				1	8								8		3		1 TO 725			
7251	TRACK MAINT WRKR SPV I	5					5								5	1	3	1				
7253	ELEC MECH SPV I	9					9				4	1	5				9	1				
7254	AUTO MACHINIST SPV I	1				1	2								2		2		1 FR 724			
7256	ELEC MOTOR REPAIR SPV I	1					1						1	1			1	1				
7258	MAINT MACHINIST SPV I	2					2						1	1			2	1				

A - ALLOCATED
 V - VACANT
 * - NOT BUDGETED

DATE JULY 31, 1987
 PREPARED BY JIM GILLEN

MAINTENANCE POSITION CONTROL
 CRAFT

CLASS	TITLE	BUDGET	GRANT	TEMP	TXD		TOTAL AVAIL	ALLOCATION BY DIVISION										TOTAL		COMMENTS	
					TO	FR		ADMIN		AUTO		TROLLEY		METRO		W & S		A	V		
								A	V	A	V	A	V	A	V	A	V				A
7264	AUTO BODY WORKER SPV I	1					1											1			
7287	SPVISING ELECTRONIC TCH	3					3						1		2				3		
7288	SIGNAL SYS MAINT SUPT	1					1							1					1		
7305	BLACKSMITH	1					1												1		
7306	AUTO BODY WORKER	38		1	5		34			17		5	1	12				34	1	3 TO 7309 2 TO 7390	
7309	CAR & AUTO PAINTER	11				3	14			4		5		5	2			14	2	3 FR 7306	
7313	AUTO MACHINIST	25					25			25								25			
7315	AUTO MACHINIST ASST SV	0		2			2						2	2				2	2		
7318	ELECTRONIC MAINT TECH	60		3			63						39	24				63			
7319	ELEC MOTOR REPAIRER	11				1	12						12					12		1 TO 7379 2 FR 7332	
7322	AUTO BODY WKR ASST SPV	2					2			1			1					2			
7326	GLAZIER	3					3						3	1				3			
7328	OPERATING ENGINEER	2					2								2			2			
7329	ELECTRNC TECH ASST SPV	14				1	13						6	7	1			13	1	1 TO 7380	
7332	MAINT MACHINIST	28	2			2	28			3			25	1				28	1	2 TO 7319	
7334	STATIONARY ENGINEER	14					14							14	3			14	3		
7335	SEN STATIONARY ENGINEER	4					4							4	1			4	1		
7340	MAINT CONTROLLER	9				4	13			13								13		4 FR 7382	
7342	LOCKSMITH	1					1							1				1			
7344	CARPENTER	9					9			6					3			9			
7345	ELECTRICIAN	5					5							5				5			
7346	PAINTER	2				1	3							3	1			3	1	1 FR 7213	
7347	PLUMBER	1					1							1				1			

A - ALLOCATED
 V - VACANT

DATE JULY 31, 1987
 PREPARED BY JIM GILLEN

MAINTENANCE POSITION CONTROL
 CRAFT

CLASS	TITLE	UNEMPLOYED	GRADE	TEMP	TXD		TOTAL ACTUAL	ALLOCATION BY DIVISION												TOTAL		COMMENTS
					TO	FR		ADMIN		AUTO		TROLLEY		METRO		W & B		A	V			
								A	V	A	V	A	V	A	V	A	V			A	V	
7355	TRUCK DRIVER	6			1		5								5	1	1 TO 7215					
7358	PATTERN MAKER	1					1															
7376	SHEETMETAL WORKER	2					2															
7379	ELEC TRANSIT MECH	129	9	12		1	151	2		2		76		71			151	1 FR 7319				
7380	ELEC TRANS MECH AST SV	17				1	18	1				8		9			18	1 FR 7329				
7381	AUTO TRANSIT MECH	108				2	106			106	4						106	4 2 TO 7387				
7382	AUTO TRANS MECH AST SV	17				4	13	1		12	1						13	1 4 TO 7340				
7387	UPHOLSTERER	0				2	2							2			2	2 FR 7381				
7390	WELDER	7		1		2	10			2		2		4			10	2 FR 7308				
7409	ELEC SRVC WORKER	64		1 *		1	64					17		47			64	1 TO 9104				
7410	AUTO SRVC WORKER	88		6		4	90			90							90	4 TO 9102				
7412	AUTO SRVC WKR ASST SPV	6					6			5				1			6					
7414	BLACKSMITH FINISHER	1					1			1							1					
7430	ASST ELEC MAINT TECH	24					24							13		9 2	24	2				
7434	MAINT MACHINIST HELPER	4					4			1				3			4					
7458	SWITCH REPAIRER	5					5							5			5	2 FR 7540				
7510	LIGHT EXT MAINT WRKR	0				2	2							23		4	23	4				
7514	GENERAL LABORER	23					23										23					
7540	TRACK MAINT WORKER	19		1		2	18							18		1	18	1 2 TO 7510				
9102	CAR CLEANER	70				4	74			4	4	37	4	33	4		74	12 4 FR 741				
9104	CAR CLEANER ASST SPV	4		1		1	6					3		3	1		6	1 1 FR 740				
9106	CAR CLEANER SPV I	1					1					1					1					
TOTAL ALLOCATED / TOTAL ACTUAL VACANT		95	6	12	30	27	27	998	5	0	316	10	162	7	306	12	209	24	998	53	5.2%	
PERM ALLOCATED / PERM ACTUAL VACANT		95	6					956	5	0	309	10	154	7	281	10	208	24	956	51	5.2%	

A - ALLOCATED
 V - VACANT

DATE JULY 31, 1987
 PREPARED BY JIM GILLEN

MAINTENANCE POSITION CONTROL
 MISCELLANEOUS

CLASS	TITLE	BUDGET	GRANT	TEMP	TXD		TOTAL AVAIL	ALLOCATION BY DIVISION												TOTAL		COMMENTS
					TO	FR		ADMIN		AUTO		TROLLEY		METHO		W & D		A	V			
								A	V	A	V	A	V	A	V	A	V			A	V	
A739	ADMIN SRVCS MGR	1					1											1				
1404	CLERK	6					2	2	3		1							6	2			
1408	PRINCIPAL CLERK	1							1									1				
1424	CLERK TYPIST	6					2	1	1		2		1					6	1			
1426	SENIOR CLERK TYPIST	5			1		4		1				3	1				4	1	TO 1630		
1444	SECRETARY I	2					2					2						2				
1446	SECRETARY II	1					1	1										1				
1630	ACCOUNT CLERK	1				6	7	4					3					7		**		
1632	SENIOR ACCOUNT CLERK	3			3		0											0		3 TO 1630		
1821	MGMT INFO SYSTEMS MGR	1		1*			2	2	1									2	1			
1823	SENIOR ADMIN ANALYST	3			2		1	1	1									1	1	2 TO 1844		
1844	SENIOR MGMT ASST	4				2	6	2		1	1	1	1	1				6	1	2 FR 1823		
1853	CONTROL CLERK	2					2		1			1						2				
1855	SENIOR CONTROL CLERK	1					1		1									1				
1920	INVENTORY CLERK	5			1		4	4										4		1 TO 1630		
1922	SENIOR INVENTORY CLERK	2			1		1	1										1		1 TO 1630		
1924	M & S SPV	2					2	2	2									2	2			
1926	SENIOR M & S SPV	1					1	1	1									1	1			
1944	MATERIALS COORDINATOR	1					1	1										1				
1948	CODING SPV	1					1	1										1				
7120	BLDGS & GROUNDS MT SUPT	2					2						2					2				
7130	GENL SUPT, FAC MAINT	1					1						1					1				
7212	AUTO TRANSIT EQUIP SPV	1					1		1	1								1	1			

A - ALLOCATED
 V - VACANT
 * - NOT BUDGETED

** 3 FR 1632
 1 FR 1920
 1 FR 1924
 1 FR 1426

DATE JULY 31, 1987
 PREPARED BY JIM GILLEN

MAINTENANCE POSITION CONTROL
 MISCELLANEOUS

CLASS	TITLE	U S E T	G R A N T	T E M P	TXD		T O T A L A U T H	A L L O C A T I O N B Y D I V I S I O N												TOTAL		COMMENTS
					TO	FR		ADMIN		AUTO		TROLLEY		METRO		W & D		A	V	A	V	
								A	V	A	V	A	V	A	V	A	V					
7214	ELEC TRANSIT EQUIP SPV	2					2					1		1					2			
7219	ESTIMATOR & SCHEDULER	3					3								3	1			3	1		
7283	TRACK MAINT SUPT	1					1								1	1			1	1		
7441	TOOLROOM MECH & CUST'N	1					1								1	1			1	1		
9185	DEPUTY GENERAL MANAGER	1					1	1											1			
TOTAL MISCELLANEOUS		61	0	1	8	8	62	26	8	10	1	5	0	8	0	15	5		62	14	22.6%	
TOTAL CRAFT & MISCELLANEOUS		1017	12	31	35	35	1060	31	8	326	11	167	7	312	12	224	29		1060	67	6.3%	

A - ALLOCATED
 V - VACANT

Comparison

Tables 2, 3, and 4 show the Cost Per Vehicle Mile, Vehicle Miles Per Staff Member, and Staff Members Per Million Vehicle Miles. These tables show that staffing levels and operating costs have been lower on new, at grade, single line light rail systems than on systems which have either complex multi line, merging track layouts (Muni) or numerous subway stations (Muni and Buffalo).

Differences in staffing levels and costs amongst these systems are largely accounted for by the differing levels of complexity of each of the systems. The more complex, higher staffed Buffalo and Muni Metro systems each have eight subway stations. These subway stations clearly require more staffing for both maintenance and operations than do similar stations in at grade systems. In the latter case (surface light rail) the maintenance and operational staffing of stations is more akin to that required for bus stops than for subway stations.

The most useable data in this survey isn't contained in the accompanying summary tables, but in the detailed information on every sort of job position at each agency contained in the body of the text. Interested in how many workers each system uses for track maintenance? It can be looked up and readily contrasted with how many overhead repair persons each system has etc.

TABLE 2

COST PER LIGHT RAIL VEHICLE MILE

<u>System</u>	<u>Annual Light Rail Vehicle Miles</u>	<u>Annual Light Budget For Light Rail</u>	<u>Cost Per Vehicle Mile (1987\$)</u>
LA/LB Light Rail	2,044,000	\$17,474,000	\$8.55
San Diego Trolley	2,071,000	\$8,328,100	\$4.02
Sacramento	1,230,000	7,400,000	\$6.02
Portland	858,012	\$4,136,367*	\$4.82*
Buffalo	700,435	10,000,000	\$14.28
Muni	4,068,750	Not available from Muni, costs of modes mixed in budget.	

* Does not include cost of 10 joint rail/bus fare inspectors.

TABLE 3

LIGHT RAIL VEHICLE MILES PER STAFF MEMBER

Sacramento	16,184
San Diego	14,793*
Portland	10,958
LB/LA (proposed)	7,169
Muni	5,755
Buffalo	4,489

*Understates San Diego efficiency since 23 employees are part-time and included here as though FTE.

TABLE 4

STAFF MEMBERS PER MILLION VEHICLE MILES OF SERVICE

<u>Operator</u>	<u>Miles of Service Provided</u>	<u>Staff</u>	<u>Staff Per Million Annual VMT</u>
San Diego Trolley	2,071,000	140	67.6
Sacramento	1,230,000	76	61.8
Portland	858,012	78.3	91.3
LB/LA Light Rail (Projected)	2,044,000	285.1 FTE	139.5
S.F. Muni	4,068,750	707 + 11 PUC	176.4
Buffalo	700,435	156	223
SCRTD Bus Service	94,779,000 (1987)	8,762	92.4

Conclusions

Long Beach/Los Angeles Light Rail Staffing Compared to San Diego, Portland and Sacramento

The available data in this survey shows that all of the new single line, at grade systems, recently opened on the West Coast of the United States (San Diego, Portland, Sacramento) operate with substantially fewer personnel than the Draft District Rail Plan proposes to provide for the Long Beach/Los Angeles Light Rail Line. This data shows that these systems have opened with staffing levels which are efficient in terms of employees per million vehicle miles of service when compared to existing District bus service, in spite of the use of larger vehicles and the need to maintain track and overhead (see Table 4).

Indeed Table 1 shows that the San Diego Trolley operated slightly more miles in 1987 than it is proposed to initially operate on the Long Beach Light Rail Line with the same size rail vehicle fleet, but with staff and budget less than half those projected for the Long Beach/Los Angeles Light Rail.

Despite having a projected operating cost per vehicle mile twice that of San Diego's Trolley, the Long Beach/Los Angeles Light Rail Line could still have a lower cost per passenger mile than current bus operations. But such a result would depend on high light rail ridership and light rail riders traveling 50% longer trips than bus riders. These results are clearly shown in Tables 5 and 6. Table 5 shows that the light rail cost per passenger will be almost twice as high as the cost per District bus passenger in same year dollars. However, this is only part of the story as shown in the following table (Table 6). Although the cost per passenger of light rail is higher than for bus, the cost per passenger mile may be lower if light rail passengers take longer trips than bus passengers. Table 6 compares the average cost per passenger mile of existing District bus service compared to the cost per passenger mile of Long Beach/Los Angeles

TABLE 5

A COMPARISON OF THE PROJECTED LONG BEACH-LOS ANGELES LIGHT RAIL LINE OPERATING COST PER PASSENGER CARRIED WITH THE AVERAGE COST PER PASSENGER CARRIED OF EXISTING DISTRICT BUS SERVICE (BOTH IN 1987 DOLLARS)

<u>SERVICE TYPE</u>	<u>ANNUAL COST (MILLIONS)</u>	<u>ANNUAL PASSENGERS CARRIED (MILLIONS)</u>	<u>COST PER PASSENGER</u>
EXISTING BUS	516.1	488.4	\$1.06
FIRST YEAR LB/LA LIGHT RAIL	17.474	8.6	\$2.03
LATER YEAR LB/LA LIGHT RAIL	17.474	11.830236	\$1.47

SOURCE: FY 1987-91 SCRTP SRTP FOR BUS DATA, DRAFT RAIL PLAN TABLE II-6, II-12 FOR LIGHT RAIL FIRST YEAR, DANA WOODBURY, PLANNING DEPARTMENT FOR LATER YEAR LIGHT RAIL PATRONAGE, 8/10/87.

TABLE 6

PROJECTED COST PER PASSENGER MILE OF THE LONG BEACH/LOS ANGELES
LIGHT RAIL COMPARED TO EXISTING DISTRICT BUS AND SAN DIEGO TROLLEY SERVICE

<u>Service</u>	<u>Annual Passengers (Millions)</u>	<u>Average Trip Distance</u>	<u>Annual Passenger Miles (Millions)</u>	<u>Annual Cost (Millions \$)</u>	<u>Cost Per Passenger Mile</u>
1987 District Bus Service	488.4	4.1 miles	2,002.94	516.1	25.77¢
LB/LA LT Rail 1st Year	8.6	6.58 miles*	56.588	17.474	30.88¢
LB/LA LT Rail Mature Year	11.830236	6.58*	77.843	17.474	22.45¢
LB/LA 1st Year	8.6	11 (EIR Assumption)	94.6	17.474	18.47¢
LB/LA LT Rail Mature Year	11.830236	11 (EIR Assumption)	130.133	17.474	13.43¢
San Diego Trolley 1987 Actual	7.00	7.9	55.3	8.3281	15.06¢

Light Rail under varying trip length assumptions. Thus even with a budget and staff twice as high as San Diego uses to provide the same service it is still possible that the Long Beach/Los Angeles Light Rail Line will provide lower cost service than existing District bus service. But only if light rail patronage is high and trip lengths are long. Certainly the probability of attaining light rail costs per passenger mile below those of the existing bus system is improved to the extent that staff size is reduced.

Staffing Compared to Buffalo and San Francisco's Muni Metro

The proposed staffing level of the Long Beach/Los Angeles Light Rail Line per million vehicle miles is lower than that of Buffalo and the Muni Metro. Both of these systems have eight subway stations of substantial size and complexity (i.e., escalators and elevators as well as stairs). It seems likely that the Long Beach/Los Angeles Light Rail Line (with its single subway station) is more complex than the all surface lines (Portland, Sacramento, and San Diego). It also seems likely that it should have less intense staffing needs than the multi subway station Muni and Buffalo systems.

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In telephone interviews, Buffalo light rail employees (who requested anonymity) stated that Buffalo's is a highly technological system requiring employee skills for maintenance not readily available locally. The system was described as actually being more heavy rail than light rail with full track circuits throughout the subway segment (5 miles out of the 6 plus total). The cars were described as very sophisticated, with computerized braking and chopper controls. The opinion was advanced that the District might think twice about the adoption of complex systems. The following (publicly released) pages describing Buffalo's operational complexity are reprinted from Operations and Control of Buffalo's Metro Rail Line by Anthony J. Schill, Rail Transportation Superintendent, Niagara Frontier Transit Metro Systems, Inc.

General comment on technology

Everyone has their own opinion as to the role of ever-more-complicated technology in the transit industry, I have chosen to present mine here.

Metro Rail has many complex elements, including train control, communications, the vehicle, etc. By and large, these systems work well, both alone and together. Of course, failures do occur occasionally and one cannot be too surprised when they do.

Nevertheless, sometimes it seems that systems are more complex and problem-prone than they really need to be. We have found, for example, that frequent human intervention on the part of the Rail Controllers is necessary to keep the train control system functioning smoothly. Train identification is a case in point. In the computer, each train carries a six digit identification consisting of block number, destination and consist (number of cars). This identification may be inputted to the computer in several ways: at a console in the Yard, on thumbswitches in each cab, and by the Train Controller. If this number does not stay with the train (which could happen if there is a failure to push a ready-to-depart button at a prescribed location) the computer will become "confused." The real train will continue on, but its computer identification will be left behind. When the actual train arrives at the next station, the computer will generate a new ID for it. Now there will be too many "trains" in the system and the automatic dispatching system will not work properly. Ultimately so many alarms will be generated by the presence of false (unscheduled or unrecognized) trains that the computer will crash.

Fortunately, we have experienced a sharp decline in the number of computer problems and we should have fewer still once the mall is completed, South Campus segment opened, etc. However, the Controller must still pay close attention to the correlation between trains and their identification and make corrections when necessary. This is easy to do under normal conditions, but it is an unnecessary distraction when real problems elsewhere demand immediate attention.

This is certainly not a major problem but may be viewed as symptomatic of what I consider to be a larger problem in the rail transit industry--i.e., a trend towards a high level of technological sophistication that exceeds what is needed to get the job done. I believe that it is critical that personnel with practical operating experience be on board during the system design phase, when the specification is drawn up, and when the vendor's submittals are approved. Such personnel should be able to spot the potential pitfalls of designs that look good on paper but which are unnecessary or impractical in actual operation. This situation applies by no means only to train control systems, but rather includes vehicle design, communications, and so on.

RECOMMENDATIONS

The length (5 miles of subway and 1.4 miles at grade), high numbers of subway stations (8), and annual car miles of operation (700,635) all make the Buffalo system seem most comparable with the Metro Rail MOS-1, not with the Long Beach/Los Angeles Light Rail Line. The Buffalo line operates approximately 88% as many miles as are scheduled for MOS-1 (700,000 versus 796,000) versus only approximately 35% of the miles scheduled for initial Long Beach/Los Angeles Light Rail operation. In addition, the Buffalo line operates in trains up to 4 cars long the same as scheduled for MOS-1 (versus 2 car initial train length possible on the Long Beach line). If the District wishes to increase projected rail staffing efficiency, it should seek a line to model its operations on which is comparable in service provided, but more efficient in staff utilization than the District now proposes to be. The role model for MOS-1 could be the Buffalo line and the role model for the Long Beach/Los Angeles line, any of the three new West Coast lines contained in this survey (Portland, Sacramento, and San Diego).

While it may not be possible to operate the Long Beach line with quite as few staff as the San Diego Trolley, any progress in that direction could have substantial positive financial implications for rail service. Even if the 69 added new transit police positions (sufficient to provide a transit policeman aboard each of the up to 11 scheduled trains, every shift) are considered irreversible, the Long Beach line still has 76 other positions beyond the level utilized at San Diego to provide as many car miles of service. If those 76 positions cost an average of \$35,000 each per year to provide (including benefits) they will cost the District roughly \$2.6 million per year or \$85-plus million over the first 35 years of operation.

It is recommended that an effort be made to eliminate some of these positions by careful comparison with actual practice at other systems as shown in this survey. In addition the District might reconsider paying for some of the 69 FTE police positions through overtime payments to other police agencies until actual experience provides some indication of

probable permanent staff level needs. If the District accepts a comparatively high, inefficient staffing level initially, the need to negotiate reductions through the labor contract process will inhibit changes. The time to design an efficient staff utilization is before service starts.

Table 12

STATISTICAL COMPARISON

LRT PROPERTY	TOTAL OPERATING EXPENSE (000)	PEAK SERVICE FLEET	ANNUAL REV VEH MILES (000)	ROUTE MILES	STAFF PER PEAK VEHICLE	COST PER REV VEH MILE (\$)
SAN FRANCISCO	29.815	82	3.941	50	11.0	7.57
BOSTON	17.564	85	1.544	59.3	8.0	11.38
CLEVELAND	7.103	28	1.054	26.2	9.4	6.74
PHILADELPHIA	37.960	163	5.559	175.9	8.0	6.83
PITTSBURGH	15.358	44	1.088	51.7	8.2	14.12
SAN DIEGO	5.928	22	1.831	21.9	5.5	3.24
LB-LA & CENTURY	28.091	64	5.900	37.3	6.8	4.76
LB-LA & CENTURY (WITHOUT SECURITY)	25.308	64	5.900	37.3	5.6	4.29

NOTE: EXCEPT FOR LB-LA & CENTURY AND SAN DIEGO, DATA DERIVED FROM NATIONAL URBAN MASS TRANSPORTATION STATISTICS, 1983 SECTION 15 ANNUAL REPORT

SOURCE: LACTC, THE LONG BEACH - LOS ANGELES RAIL TRANSIT PROJECT
O & M COST ESTIMATE, JULY 1986.

World List of Light Rail / Streetcar Systems

As of December 31, 1984

Argentina Buenos Aires	Brandenburg Cottbus Dessau Dresden Erfurt Frankfurt/Oder Gera Gorlitz Gotha Halberstadt Halle Jena Karl-Marx-Stadt Leipzig Magdeburg Naumburg Nordhausen Plauen Potsdam Rostock Schöneiche Schwerin Strausberg Woltersdorf Zwickau	Italy Milan Naples Rome Sopralobzano Torino Trieste	Russia Iasi Oradea Sibiu Timisoara	Russia Kemerovo Khabarovsk Kharkov Kiev Kolomna Komsomolsk Konotop Konstantinovka Kopeysk Kramatorsk Krasnoarmeysk Krasnodar Krasnoturinsk Krasnoyarsk Krivoy Rog Kronshtadt Kursk Kuybyshev Leningrad Liepaja Lipetsk Lvov Magnitogorsk Makeyevka Minsk Moscow Nikolayev Nizhnekamsk Nizhniy Tagil Noginsk Novocherkassk Novokuznetsk Novorossiysk Novopolotsk Novosibirsk Novo-Troitsk Odessa Omsk Ordzhonikidze Orel Orsk Osinniki Pavlodar Perm Poti Prokopyevsk Pyatigorsk Riga Rostav-na-Donu Ryazan Rzhev Salavat Saratov Shakhty Smolensk Staraya Russa Staryy Oskol Sumgait Sverdlovsk Taganrog Tallinn Tashkent Tbilisi Temirtau Tomsk Toropets Tula Ufa Uglegorsk Ulan-Ude Ulyanovsk Usolye Sibirskoye Ust-Ilimsk Ust-Kamenogorsk Velikiye Luki Vinnitsa
Australia Adelaide Bendigo Melbourne		Japan Enoshima Gifu Hakodate Hiroshima Kagoshima Kitakyushu Kochi Kumamoto Kyoto Matsuyama Nagasaki Okayama Osaka Sapporo Takaoka Tokyo Toyama Toyohashi	Spain Barcelona Soller	
Austria Gmunden Graz Innsbruck Linz Salzburg Vienna			Sweden Goteborg Lidingo Norrkoping Stockholm	
Belgium Antwerp Brussels Charleroi Ghent Oostende			Switzerland Basel Bern Bex Geneva Neuchatel Zurich	
Brazil Bertogoa Campos de Jordao Rio de Janeiro Santa Luiz Santos	Germany (West) Augsburg Bielefeld Bochum Bonn Bottrop Braunschweig Bremen Darmstadt Dortmund Duisburg Dusseldorf Essen Frankfurt/Main Freiburg Gelsenkirchen Hannover Heidelberg Karlruhe Kassel Kiel Koln (Cologne) Krefeld Ludwigshafen Mainz Mannheim Mulheim/Ruhr Munich Nurnberg Stuttgart Ulm Wuppertal Wurzburg	Mexico Mexico City		
Bulgaria Sofia		Netherlands Amsterdam Rotterdam The Hague Utrecht		
Canada Calgary Edmonton Toronto		Norway Oslo Trondheim	U. S. A. Boston Buffalo Cleveland Detroit Fort Worth Lowell Newark New Orleans Philadelphia Pittsburgh San Antonio San Diego San Francisco Seattle Yakima	
China Anshan Changchun Dalian Harbin		Paraguay Ascuncion		
Czechoslovakia Bratislava Brno Kosice Liberec Most Olomouc Ostrava Plzen Prague Teplice		Philippines Manila	U. S. S. R. Achinsk Alma-Ata Angarsk Arkhangelsk Astrakhan Avdeyevka Baku Barnaul Biysk Bogoroditsk Bratsk Brezhnev Chelyabinsk Cherepovets Chernigov Chita Daugavpils Dneprodzerzhinsk Dnepropetrovsk Donetsk Druzhkovka Dzerzhinsk Gorki Gorlovka Gorznyy Irkutsk Ivanovo Izhevsk Kalinin Kaliningrad Karaganda Karpinsk Kazan	
Egypt Alexandria Cairo Heliopolis Helwan		Poland Bydgoszcz Czestochowa Elblag Gdansk Gorzow Grudziadz Katowice Krakow Lodz Poznan Szczecin Torun Warsaw Wroclaw		
England Blackpool	Hong Kong Hong Kong			
Finland Helsinki	Hungary Budapest Debrecen Miskolc Szeged	Portugal Lisbon Porto Sintra		
France Lille Marseilles St. Etienne	India Calcutta	Romania Arad Braila Bucharest Constanta Galati		
Germany (East) Bad Schandau Berlin	Isle of Man Douglas			

Vitebsk Vladivostok Volograd Voizhskiy Voronezh Voroshilovgrad Vyazma Yenakiyevo Yerevan Yevpatoriya Zaporozhye Zhadnov Zhitomir Zlatoust	Yugoslavia Belgrade Osijek Sarajevo Zagreb	Italy Genoa	Opened 1984	Abandoned 1984
Vietnam Hanoi	<i>Under Construction, 1984</i>	Poland Tarnow	Brazil Santos	None
	Czechoslovakia Chomutov	Tunisia Tunis	Germany (West) Bottrop	
	France Grenoble Nantes	Turkey Ankara	Philippines Manila	
		U. S. A. Orlando Portland Sacramento San Jose	Romania Constanta	
			U. S. A. Buffalo Fort Collins	

World List of Metro / Subway/ Heavy Rail Systems

As of December 31, 1984

Argentina Buenos Aires	Greece Athens	Scotland' Glasgow	Under Construction	Spain Seville Valencia
Austria Vienna	Hong Kong Hong Kong	Spain Barcelona Madrid	Argentina Cordoba	Taiwan Taipei
Belgium Brussels	Hungary Budapest	Sweden Stockholm	Brazil Belo Horizonte Porto Alegre Recife	U. S. S. R. Alma Ata Dnepropetrovsk Gorki Kuibyshev Novosibirsk Omsk Riga Rostov-na-Donu Sverdlovsk
Brazil Rio de Janeiro Sao Paulo	India Calcutta	U. S. A. Atlanta Baltimore Boston Chicago Cleveland Miami New York City & Vicinity Philadelphia San Francisco Washington, D. C.	Bulgaria Sofia	
Canada Montreal* Toronto	Italy Milan Rome		Canada Vancouver***	
Chile Santiago*	Japan Fukuoka Kobe Kyoto Nagoya Osaka Sapporo* Tokyo Yokohama		China Harbin	
China Beijing Tianjen	Korea (North) Pyongyang	U. S. S. R. Baku Kharkov Kiev Leningrad Minsk Moscow Tashkent Tbilisi Yerevan	Colombia Medellir	Opened 1984
Czechoslovakia Prague	Korea (South) Seoul		Egypt Cairo	China Tianjen
England London Newcastle/Tyne	Mexico Guadalajara** Mexico City*		Iran Tehran (work suspended 1979)	India Calcutta
Finland' Helsinki	Netherlands Amsterdam Rotterdam	Venezuela Caracas	Iraq Baghdad	U. S. A. Miami
France Lille* Lyon* Marseilles* Paris (* some lines)			Italy Naples	U. S. S. R. Minsk
Germany (East) Berlin	Norway Oslo		Japan Sendai	
Germany (West) Berlin Hamburg Munich Nurnberg	Portugal Lisbon		Korea (South) Pusan	* Rubber-Tired System
	Romania Bucharest		Poland Warsaw	** Uses Standard Trolleybuses
			Singapore Singapore City	***Unproven Technology