

**BART CLIPS
DERAILMENT - 9/10**

Mike Healy, Dept. Mgr.
Public Affairs

NEWS RELEASE



BAY AREA RAPID TRANSIT DISTRICT 800 Madison St. P.O. Box 12688, Oakland, CA 94604-2688 (510) 464-6000

CONTACT: Mike Healy
Department Manager
Marketing, Media & Public Relations
Phone No. 510/464-7110
FAX: 510/464-7103

September 21, 1993

FOR IMMEDIATE RELEASE

BART ISSUES FINAL REPORT ON 1992 DERAILMENT

BART today released the final report on the transit system's December 17, 1992 derailment of a train in a downtown Oakland Tunnel.

The independent report, prepared by the American Public Transit Association (APTA) at BART's request, concurred in the initial conclusions and principal findings by BART's own investigative team. APTA's report was also consistent with the conclusions of the National Transportation Safety Board, and Zeta Tech, a New Jersey-based consulting firm hired by BART to perform simulation tests of the accident - that the derailment was the result of worn rail and wheel interaction at a "facing" switch point.

BART General Manager, Frank J. Wilson, praised the reports as reflecting a thorough and painstaking analysis of the data by the various investigative teams.

He said that BART has already adopted the key recommendations made by the APTA report, most of which have already been or are in the process of being implemented as a result of the transit district's own investigation.

The report commended BART for taking immediate action to preclude any recurrence of this type of incident.

These actions included a systemwide inspection of wheels and track; the adoption of more conservative wheel and rail standards, the acceleration of replacement of all rail and switches which were scheduled for replacement according to BART's normal maintenance cycle and the imposition of certain operating restrictions.

Wilson noted that BART has adopted a standard for wheel wear tolerance and track maintenance that is more conservative than the industry standard.

#####

Mike Healy, Dept. Mgr.
Public Affairs

NEWS RELEASE



BAY AREA RAPID TRANSIT DISTRICT 800 Madison St. P.O. Box 12688, Oakland, CA 94604-2688 (510) 464-6000

CONTACT: Mike Healy
Department Manager
Marketing, Media & Public Relations
Phone No. 510/464-7110
FAX: 510/464-7103

September 21, 1993

FOR IMMEDIATE RELEASE

BART ISSUES FINAL REPORT ON 1992 DERAILMENT

BART today released the final report on the transit system's December 17, 1992 derailment of a train in a downtown Oakland Tunnel.

The independent report, prepared by the American Public Transit Association (APTA) at BART's request, concurred in the initial conclusions and principal findings by BART's own investigative team. APTA's report was also consistent with the conclusions of the National Transportation Safety Board, and Zeta Tech, a New Jersey-based consulting firm hired by BART to perform simulation tests of the accident - that the derailment was the result of worn rail and wheel interaction at a "facing" switch point.

BART General Manager, Frank J. Wilson, praised the reports as reflecting a thorough and painstaking analysis of the data by the various investigative teams.

He said that BART has already adopted the key recommendations made by the APTA report, most of which have already been or are in the process of being implemented as a result of the transit district's own investigation.

The report commended BART for taking immediate action to preclude any recurrence of this type of incident.

These actions included a systemwide inspection of wheels and track; the adoption of more conservative wheel and rail standards, the acceleration of replacement of all rail and switches which were scheduled for replacement according to BART's normal maintenance cycle and the imposition of certain operating restrictions.

Wilson noted that BART has adopted a standard for wheel wear tolerance and track maintenance that is more conservative than the industry standard.

#####

Mike Healy, Dept. Mgr.
Public Affairs

NEWS RELEASE



BAY AREA RAPID TRANSIT DISTRICT 800 Madison St. P.O. Box 12688, Oakland, CA 94604-2688 (510) 464-6000

CONTACT: Mike Healy
Department Manager
Marketing, Media & Public Relations
Phone No. 510/464-7110
FAX: 510/464-7103

September 21, 1993

FOR IMMEDIATE RELEASE

BART ISSUES FINAL REPORT ON 1992 DERAILMENT

BART today released the final report on the transit system's December 17, 1992 derailment of a train in a downtown Oakland Tunnel.

The independent report, prepared by the American Public Transit Association (APTA) at BART's request, concurred in the initial conclusions and principal findings by BART's own investigative team. APTA's report was also consistent with the conclusions of the National Transportation Safety Board, and Zeta Tech, a New Jersey-based consulting firm hired by BART to perform simulation tests of the accident - that the derailment was the result of worn rail and wheel interaction at a "facing" switch point.

BART General Manager, Frank J. Wilson, praised the reports as reflecting a thorough and painstaking analysis of the data by the various investigative teams.

He said that BART has already adopted the key recommendations made by the APTA report, most of which have already been or are in the process of being implemented as a result of the transit district's own investigation.

The report commended BART for taking immediate action to preclude any recurrence of this type of incident.

These actions included a systemwide inspection of wheels and track; the adoption of more conservative wheel and rail standards, the acceleration of replacement of all rail and switches which were scheduled for replacement according to BART's normal maintenance cycle and the imposition of certain operating restrictions.

Wilson noted that BART has adopted a standard for wheel wear tolerance and track maintenance that is more conservative than the industry standard.

#####

CONTACT: Mike Healy
Department Manager
Marketing, Media & Public Relations
Phone No. 510/464-7110
FAX: 510/464-7103

September 21, 1993

FOR IMMEDIATE RELEASE**BART ISSUES FINAL REPORT ON 1992 DERAILMENT**

BART today released the final report on the transit system's December 17, 1992 derailment of a train in a downtown Oakland Tunnel.

The independent report, prepared by the American Public Transit Association (APTA) at BART's request, concurred in the initial conclusions and principal findings by BART's own investigative team. APTA's report was also consistent with the conclusions of the National Transportation Safety Board, and Zeta Tech, a New Jersey-based consulting firm hired by BART to perform simulation tests of the accident - that the derailment was the result of worn rail and wheel interaction at a "facing" switch point.

BART General Manager, Frank J. Wilson, praised the reports as reflecting a thorough and painstaking analysis of the data by the various investigative teams.

He said that BART has already adopted the key recommendations made by the APTA report, most of which have already been or are in the process of being implemented as a result of the transit district's own investigation.

The report commended BART for taking immediate action to preclude any recurrence of this type of incident.

These actions included a systemwide inspection of wheels and track; the adoption of more conservative wheel and rail standards, the acceleration of replacement of all rail and switches which were scheduled for replacement according to BART's normal maintenance cycle and the imposition of certain operating restrictions.

Wilson noted that BART has adopted a standard for wheel wear tolerance and track maintenance that is more conservative than the industry standard.

#####

CONTACT: Mike Healy
Department Manager
Marketing, Media & Public Relations
Phone No. 510/464-7110
FAX: 510/464-7103

September 21, 1993

FOR IMMEDIATE RELEASE

BART ISSUES FINAL REPORT ON 1992 DERAILMENT

BART today released the final report on the transit system's December 17, 1992 derailment of a train in a downtown Oakland Tunnel.

The independent report, prepared by the American Public Transit Association (APTA) at BART's request, concurred in the initial conclusions and principal findings by BART's own investigative team. APTA's report was also consistent with the conclusions of the National Transportation Safety Board, and Zeta Tech, a New Jersey-based consulting firm hired by BART to perform simulation tests of the accident - that the derailment was the result of worn rail and wheel interaction at a "facing" switch point.

BART General Manager, Frank J. Wilson, praised the reports as reflecting a thorough and painstaking analysis of the data by the various investigative teams.

He said that BART has already adopted the key recommendations made by the APTA report, most of which have already been or are in the process of being implemented as a result of the transit district's own investigation.

The report commended BART for taking immediate action to preclude any recurrence of this type of incident.

These actions included a systemwide inspection of wheels and track; the adoption of more conservative wheel and rail standards, the acceleration of replacement of all rail and switches which were scheduled for replacement according to BART's normal maintenance cycle and the imposition of certain operating restrictions.

Wilson noted that BART has adopted a standard for wheel wear tolerance and track maintenance that is more conservative than the industry standard.

#####

APTA Report

on

Derailment

of

December 17, 1992

**Engineering & Operations
Committee**

September 21, 1993

SUMMARY OF ACCIDENT

At approximately 11:21 p.m. Thursday, December 17, 1992, a southbound six-car train, traveling in the reverse direction on the Richmond-Fremont Line, derailed while moving through A05 interlocking. The interlocking is located approximately 200 feet south of 12th Street Station.

The lead truck of the third car derailed just past the point of switch. This action caused the trailing truck of the second car also to derail. The second and third cars struck a concrete wall causing severe damage to both cars.

Fourteen passengers suffered minor injuries.

BART IMMEDIATE ACTIONS

- Conducted system-wide inspections of all switches and curves. Completed December 29, 1992.
- Applied a more conservative wheel flange size, resulting in removing 39 cars from service for immediate wheel work.
- Replaced 12 switches in turnouts ahead of schedule. Completed January 30, 1993.
- Initiated technical wheel / rail dynamics study. Zeta-Tech Associates completed study July '93.
- Implemented speed restrictions and human safeguards for reverse running through certain facing point switches.

INVESTIGATIONS

BART:

The combination of the worn conditions of the switch rail, wheel and flange with the train/track dynamics, although each individual element was within established standards.

NAT'L. TRANSPORTATION SAFETY BOARD:

Wear conditions of the wheel and rail allowed the wheel to climb over a switch rail in a tight radius curve.

AMERICAN PUBLIC TRANSIT ASSOCIATION:

The interaction of worn wheels and worn rail at the switch point.

CONCLUSION:

There are no disagreements with the causes / findings from all three investigative agencies.

This was corroborated by the analysis of a wheel / rail interaction study conducted by Zeta-Tech Associates.

WHEEL / RAIL RECOMMENDATIONS

APTA's Recommendations

1. Re-evaluate BART's track wear standards.
2. Re-evaluate BART's wheel wear standards.
3. Investigate track/wheel dynamic forces.
4. Ensure wheel truing occurs at a pre-determined point.
5. Discontinue use of the GO/NO-GO wheel gauge.

BART's Response

- Track Wear Standard was reduced from 3/4" to 5/8" going to 1/2".
- Wheel Wear Standard was reduced from a #8 to #7, going to #6.
- Zeta-Tech has conducted an analysis of the wheel/track dynamic forces.
- Wheel maintenance program is being changed to accomplish this.
- BART is purchasing electronic gauges.

7. Investigate the adequacy of wheel truing capacity.

New higher capacity machines are being purchased.

8. BART should establish an independent maintenance audit.

Review and comparison of industry-wide wheel and track standards is underway. Scope of work for following maintenance audit is under preparation.

PROCEDURAL RECOMMENDATIONS

APTA's Recommendations

BART's Response

- | | |
|---|--|
| 6. Establish a policy for turning cars. | Fleet completed August of '93; criteria to be developed for periodic turning. |
| 9. Responsibility for preserving evidence in Emergency Response Manual. | Emergency Plan, the Operations, Rules and Procedures & the Operations Control Center Manual have been revised. |
| 10. Tighten procedures for impounding evidence. | Appropriate procedures in revised manuals. |
| 12. Enforce radio terminology, protocol and procedures. | Communications procedures reinforced with all operations employees. |

15. Explain emergency braking in a rule.

Rule is currently in Train Operator Manual. Recertification training will re-emphasize.

17. Periodically inspect emergency exits.

Current practice; frequency of inspections will be increased.

18. Review communications systems maintenance program for reliability.

Currently under review. The Communications System is scheduled for replacement in '95.

RELATED RECOMMENDATIONS

<u>APTA's Recommendations</u>	<u>BART's Response</u>
11. Review current Drug policy.	Drug policy reviewed and compliant.
13. Implement revisions to Central Procedures Manual.	Revisions to the Manual are being implemented.
14. Provide annunciators in the operating cab.	Annunciators already are in the operating cabs.
16. Implement procedure to advise train operators of route changes.	Standard policy; procedure in Manual revision.
19. Provide area ID at subway emergency phone location.	Under review. Phone activation annunciates location to Central.

Mike Healy, Dept. Mgr.
Public Affairs

NEWS RELEASE



BAY AREA RAPID TRANSIT DISTRICT 800 Madison St. P.O. Box 12688, Oakland, CA 94604-2688 (510)464-6000

CONTACT: Mike Healy
Department Manager
Marketing, Media & Public Relations
Phone No. 510/464-7110
FAX: 510/464-7103

September 21, 1993

FOR IMMEDIATE RELEASE

BART ISSUES FINAL REPORT ON 1992 DERAILMENT

BART today released the final report on the transit system's December 17, 1992 derailment of a train in a downtown Oakland Tunnel.

The independent report, prepared by the American Public Transit Association (APTA) at BART's request, concurred in the initial conclusions and principal findings by BART's own investigative team. APTA's report was also consistent with the conclusions of the National Transportation Safety Board, and Zeta Tech, a New Jersey-based consulting firm hired by BART to perform simulation tests of the accident - that the derailment was the result of worn rail and wheel interaction at a "facing" switch point.

BART General Manager, Frank J. Wilson, praised the reports as reflecting a thorough and painstaking analysis of the data by the various investigative teams.

He said that BART has already adopted the key recommendations made by the APTA report, most of which have already been or are in the process of being implemented as a result of the transit district's own investigation.

The report commended BART for taking immediate action to preclude any recurrence of this type of incident.

These actions included a systemwide inspection of wheels and track; the adoption of more conservative wheel and rail standards, the acceleration of replacement of all rail and switches which were scheduled for replacement according to BART's normal maintenance cycle and the imposition of certain operating restrictions.

Wilson noted that BART has adopted a standard for wheel wear tolerance and track maintenance that is more conservative than the industry standard.

#####

REPORT

of the

American Public Transit Association

Panel of Inquiry

for the

December 17, 1992

Derailment on the Richmond-Fremont Line

of the

San Francisco Bay Area Rapid Transit District

Final Report

June, 1993

**A Service of the
Rail Safety Review Board**



APTA EXECUTIVE COMMITTEE 1992-1993

Chairman

Louis J. Gambaccini
Chief Operations Officer/
General Manager
Southeastern Pennsylvania Transportation
Authority
714 Market Street, Suite 300
Philadelphia, PA 19106
(215) 580-7070
Fax: (215) 580-3636

Vice Chairman

Rod Diridon
Supervisor, Fourth District
Chair, Transportation Joint Conference
Committee
Santa Clara County Transit District
Board of Supervisors
70 West Hedding Street
San Jose, CA 95110
(408) 299-3924
Fax: (408) 298-8460

Secretary/Treasurer

Fred M. Gilliam
President/General Manager/CEO
Memphis Area Transit
1370 Levee Road
Memphis, TN 38108
(901) 722-7111
Fax: (901) 722-7123

Immediate Past Chairman

Louis H. Parsons
Chairman
GO Transit
1120 Finch Avenue West
Downsview, Ontario
Canada M3J 3J8
(416) 665-9211
Fax: (416) 665-9006 or
Fax: (416) 278-0541

Jack R. Gilstrap
Executive Vice President
American Public Transit Association
Washington, DC

VICE PRESIDENTS

Human Resources

Ellenese Brooks-Simms
Chairwoman
Board of Commissioners
Regional Transit Authority
101 Dauphine at Canal
New Orleans, LA 70112
(504) 569-2853
Fax: (504) 569-2892

Governing Boards

R.O. (Bob) Laird
Member
Board of Trustees
Metropolitan Tulsa Transit Authority
5727 South Lewis, Suite 830
Tulsa, OK 74105
(918) 744-0360
Fax: (918) 744-5088

Rail Transit

Peter E. Stangl
Chairman and Chief Executive Officer
Metropolitan Transportation Authority
347 Madison Avenue, 7th Floor
New York, NY 10017
(212) 878-7200
Fax: (212) 878-7030

Associate Members

Bill J. Chaddock
Executive Vice President
Hausman Bus Sales, Inc.
10 East Golf Road
Des Plaines, IL 60016
(708) 299-9900
Fax (708) 299-7843

Canadian Members

Robert G. Lingwood
General Manager
Victoria and Municipal System
British Columbia Transit
520 Gorge Road East
P.O. Box 610
Victoria, British Columbia
Canada V8W 2P3
(604) 385-2551
Fax: (604) 384-5412

Management and Finance

Paul A. Toliver
Director of Transit
Seattle Metro
821 Second Avenue, MS 55
Seattle, WA 98104
(206) 684-1441
Fax: (206) 684-1778

Government Affairs

Richard F. Davis
General Manager
Kansas City Area Transportation
Authority
1200 East 18th Street
Kansas City, MO 64108
(816) 346-0210
Fax: (816) 346-0270

Small Operations

Dennis D. Louwse
Executive Director
Berks Area Reading Transportation
Authority
1700 North 11th Street
Reading, PA 19604
(215) 921-0605
Fax: (215) 921-9420

Associate Member-at-Large

David L. Turney
CEO, LUMINATOR and
Group Executive
Mark IV Transportation Products Group
1200 East Plano Parkway
Plano, TX 75074
(214) 424-6511
Fax: (214) 423-8515

Marketing

Gerald T. Haugh
General Manager
San Mateo County Transit District
1250 San Carlos Avenue
San Carlos, CA 94070-1306
(415) 508-6221
Fax: (415) 508-6281

Bus Operations

Robert G. MacLennan, P.E.
General Manager
Metropolitan Transit Authority
of Harris County
1201 Louisiana
Houston, TX 77002
(713) 739-4830
Fax: (713) 759-9537

REPORT
of the
American Public Transit Association
Panel of Inquiry

December 17, 1992 Derailment
for the
San Francisco Bay Area Rapid
Transit District

Panel Members

Langley C. Powell, Chairman
Dan Estep
Earle M. Hughes, P.E.
Charles N. Yongue

A Service of the
Rail Safety Review Board

Robert G. Schwab, Chairman

Kenneth M. Gregor, Vice Chairman

Harvey W. Becker, Board Secretary

produced by

American Public Transit Association
Technical Services Department

Frank J. Cihak
Chief Engineer and Deputy Executive Vice President-Technical Services

Paul J. Lennon
Chief Safety Officer and Administrator-Safety Audit Programs

1201 New York Avenue, N.W., Washington, DC 20005

TABLE OF CONTENTS

FOREWORD	5
PART I. EXECUTIVE SUMMARY	7
PART II. INTRODUCTION	9
A. Accident Description	9
B. Emergency Response	10
C. Investigation Request	10
D. Scope of Report	11
PART III. ACCIDENT INVESTIGATION	13
A. Investigation Process	13
B. Investigation Findings	13
PART IV. FINDINGS	21
PART V. PROBABLE CAUSE	23
PART VI. RECOMMENDATIONS	25
APPENDIX:	
1. Bart System Map	27
2. Track Layout	29
3. Applicable BART Rules and Regulations	31

FOREWORD

The purpose of the Rail Safety Review Board of the American Public Transit Association is to provide expert transit industry review of rail systems and to investigate major rail accidents by means of a Safety Review service for rail systems and a Panel of Inquiry service for major rail accidents.

The benefits to the transit industry and each participating transit system are an increased level of information exchange, an independent review of system practices by persons specializing in rail transit safety, and the ability to quickly mobilize transit experts to provide an on-the-scene investigation team to determine causes of a major rail transit accident.

The Rail Safety Review Board functions as an activity of the American Public Transit Association, the international organization representing the transit industry. APTA members serve the public interest by providing safe, efficient, and economical transit service, and by improving that service to meet national energy, environmental, and financial concerns. Ninety-five percent of those using public transit in the U.S. are carried by APTA members.

APTA members include 400 motor bus and rail rapid transit systems, and the organizations responsible for planning, designing, constructing, financing, and operating transit systems. In addition, APTA members include business organizations which supply products and services to the transit industry, academic institutions, and public interest groups.

As a background to this report, an accident occurred on December 17, 1992, on the Richmond-Fremont line of the San Francisco Bay Area Rapid Transit District (BART). Utilizing the accident investigation service provided by APTA, General Manager Frank J. Wilson requested APTA to establish a Panel of Inquiry for this accident.

The Panel of Inquiry, which was charged with investigating the cause of the accident and reporting its findings and recommendations to the San Francisco Bay Area Rapid Transit District, includes Langley C. Powell, President and General Manager, San Diego Trolley, Inc.; Earle M. Hughes, Assistant General Manager, Port Authority Transit Corporation; Dan Estep, Manager of Rail Car Maintenance, Metropolitan Atlanta Rapid Transit Authority; and Charles N. Yongue, Director of Field Operations, Office of System Safety, New York City Transit Authority. Mr. Langley C. Powell is chairman.

The Panel began its investigation on Saturday, December 19, 1992, visiting the accident site as well as studying the operation of the Richmond-Fremont line. The Panel was given full access to all pertinent records, equipment, and facilities. Panel members interviewed BART personnel believed by it to have relevant information. The Panel also was provided with BART records of the accident as well as reference materials requested by the Panel.

I. EXECUTIVE SUMMARY

Summary of Accident

At approximately 11:21 p.m., P.S.T., Thursday, December 17, 1992, a south-bound six-car San Francisco Bay Area Rapid Transit District (BART), train (278), traveling in the reverse direction on the Richmond-Fremont Line derailed while moving through switch #153 at A05 interlocking (reference Appendix 1). The interlocking is located approximately two hundred (200) feet south of 12th Street Station on the upper level of the Oakland Wye, in downtown Oakland, California.

Pursuant to instructions received from Central Control, the train was being moved (automatic mode) on track C1 over switch #153, reverse, toward Lake Merritt. The purpose of the move was to confirm the time required to run trains, reverse, from MacArthur, through the 19th and 12th Street Stations to Fruitvale Station. As the third car (#753) of the six car train entered the #8 left-hand turnout of switch #153, the lead truck derailed and proceeded south along track M2, then pulled the trailing truck of car #676 off the track. Subsequently, the trailing "Y" end of car #676 and the lead "X" end of car #753 hit the curtain wall and stopped. As the result of this collision, #676, #753 and #316 cars sustained severe damage. The train's lead car, #113, and the lead truck of the second car, #676, remained on the track.

The second car, #676, sustained the most severe damage when it made contact with the curtain wall. The front two-thirds of car #676 remained on the track

and followed the lead car for a distance of about 25 feet before coming to rest south of the Oakland Avenue upper level station platform. Appendix 2 to this report is a plan view of the interlocking, depicting the final resting place of the first five cars of the train superimposed upon it.

The tunnel structure, track, third rail and wayside signal equipment sustained minor damage in the derailment. BART's initial estimate of property damage was \$2.2 million.

An estimated 62 passengers were aboard the train. There were no fatalities resulting from the derailment. Approximately 14 passengers received minor injuries and were treated and released that night.

Summary of Key Panel Findings

At the request of the General Manager, San Francisco Bay Area Rapid Transit District (BART), a Panel of Inquiry was formed by the American Public Transit Association (APTA) on Friday, December 18, 1992, to conduct an investigation into the cause of the accident and to develop specific findings and recommendations to help develop ways to prevent recurrence of this type of accident.

Based on the data obtained, evidence reviewed, and interviews conducted by the Panel, the following principal findings were reached:

- The probable cause of the accident was the interaction of worn wheels,

worn switch point and stock rail with the train operating through a facing point turn out move.

- The car equipment and the track system functioned as designed, however current maintenance standards for rail, switch, and wheels contributed to the derailment.
- The carborne automatic train operation equipment and wayside signal equipment were not contributing factors to the derailment.
- The track fasteners, ties, and frog of the turnout were not contributing factors to the derailment.

Summary of Key Panel Recommendations

The Panel has divided its principal recommendations on preventing a recurrence of this type of accident into near and long term solutions:

- Near term: Inspect all rail car wheels for worn flanges and review wheel condemning criteria; review track wear standards, and inspect all turnouts wherein the normal direction of traffic for turnout moves through a switch in a trailing point move; restrict all reverse direction movements in similar circumstances to automatic operations at reduced speed with a ground observer; and establish procedures to ensure cars operating on captive routes be turned at regular intervals to equalize wheel wear.

- Long term: Consider additional wheel truing equipment; investigate wheel/rail interaction of BART cars with special emphasis on revising existing rail and wheel wear criteria; revise operating and emergency procedures.

Comments

In addition to these key findings and recommendations, the Panel made other findings and recommendations with respect to the operation and maintenance of the BART system which deserves management review and action, and which could serve to improve the overall safety program at BART. They are detailed in Section IV, Findings, and in Section VI, Recommendations.

BART's management is to be commended for taking immediate action to preclude any recurrence of this incident. The Panel members and APTA express their appreciation to the BART staff for the professional and courteous treatment afforded them during the conduct of this investigation. The Panel members are also appreciative of the opportunity each has had to learn from the BART staff and by observation of the BART accident investigation process.

II. INTRODUCTION

A. Accident Description

At approximately 11:21 p.m., P.S.T., Thursday, December 17, 1992, an accident occurred on the Richmond-Fremont Line of the BART System. The accident took place at interlocking AO5, switch #153, approximately 200 feet south of the 12th Street Station platform in downtown Oakland. The accident involved a southbound six-car train designated as train 278 consisting of lead car #113 followed by #676, #753, #316, #601 and #336. Pursuant to instructions received from Operations Control Center (OCC), the train was being moved (automatic mode) on track C1 over switch #153, reverse, toward Fruitvale Station. The purpose of the move was to confirm calculations of the time required to run trains, reverse, from MacArthur, through the 19th and 12th Street Stations to Fruitvale.

In preparation for maintenance work on tracks A1 and A2, south of Lake Merritt, during January 1993, plans were made to run a few trains from MacArthur to Fruitvale Stations to confirm running times, familiarize train operators with the operation, and to check switches and interlockings. Earlier that evening a train operated over this route and experienced a false occupancy indication. As a result a decision was made to run a second train over the same route to confirm the timing. It was during the second run that the derailment occurred. This move occurred during revenue service in automatic train operation, and under this

condition, communication with the OCC was not required.

The train left the 12th Street Station, reverse running, and began to accelerate to 18 mph, the authorized speed for this section of track. The train approached switch #153 which had been aligned for a left-hand turn onto track C1 toward Lake Merritt. The first two cars, #113 and #676, successfully negotiated the turnout. The lead truck, #2 wheel, of the third car (#753), however, climbed the right-hand closed switch point between 18-24" south of the point of switch #153 and derailed along track M2. As the train continued to move, the angle between the ends of the second and third cars, respectively, continued to increase until the trailing truck of the second car derailed and the lead truck of the third car was pulled across the track M2 and collided with a curtain wall located at the junction of the tracks C1/-M2. The collision with the curtain wall resulted in the rear bolster assembly and car body structure being torn from the second car, #676. After the collision with the curtain wall, the lead car, #113, and the front portion of #676 car continued moving to the south on track C1. After stopping, the distance between the two sections of the second car was approximately 25 feet. The last three cars remained on track C1 and sustained only minor damage.

An estimated 62 passengers were on board the six-car train. Of these 14 were transported to local hospitals where they were treated for minor injuries and re-

leased. Some of the remaining passengers claimed to have sustained minor injuries but declined medical attention. The majority of the injuries were located in the second and third cars.

The track sustained minor damage; 10 feet of third rail and about 100 feet of third rail coverboard was destroyed. The signal system sustained minor damage. The total cost of damage was estimated by BART to have been \$2.2 million.

B. Emergency Response

The accident was first recorded at 11:21 p.m. when the OCC received third rail trip alarms of power off conditions on two third rail sections, KR06 & KR03 as an overload attributed to train 278. OCC contacted the train operator of train 278 who confirmed the appearance of an overload problem. OCC then directed the train operator to check the train. At 11:22 p.m. the train operator reported to OCC that the train had derailed, there was smoke in the area, and some passengers had been injured. The train controller advised all trains that an emergency was in progress. At 11:24 p.m. the BART Police Department was notified of the incident and responded immediately, establishing a command post at the Station Agent's Booth at the 11th Street-Broadway end of the station. At 11:25 p.m. the Oakland Fire Department was notified by the OCC of the derailment and smoke at the 12th Street-Broadway Station. The fire department responded within five to ten minutes and assisted in the location and removal of passengers from the scene.

The Alameda County Emergency Medical Services responded and established a central receiving area at the 11th Street-Broadway end of the station. A triage area was established on the platform.

At 11:50 p.m. police, fire department, and BART searchers confirmed the evacuation of all passengers.

C. Investigation Request

On the morning of Friday, December 18, 1992, Ralph S. Weule, Executive Manager, Safety and Investigations, on behalf of Frank Wilson, General Manager, San Francisco Bay Area Rapid Transit District, requested that an APTA Panel of Inquiry be established. APTA then began the process of assembling a Panel whose expertise coincided with the basic details of the accident. It was agreed that the Panel would assemble in the BART Office of System Safety on the morning of December 20, 1992. Based on the accident detail provided by BART staff and the requirements of APTA's Rail Safety Review Board Charter, the Panel was assembled as follows:

Langley C. Powell
Chairman, Panel of Inquiry
President and General Manager
San Diego Trolley, Inc.
San Diego, California

Earle M. Hughes, P.E.
Assistant General Manager
Engineering & Maintenance
Port Authority Transit Corporation
Lindenwold, New Jersey

Dan Estep
Manager of Rail Car Maintenance
Metropolitan Atlanta Rapid Transit
Authority
Decatur, Georgia

Charles N. Yongue
Director, Field Operations
Office of System Safety
New York City Transit Authority
Brooklyn, New York

The APTA support and coordination were provided by:

Frank J. Cihak, Chief Engineer and Deputy Executive Vice President-Technical Services
American Public Transit Association
Washington, D.C.

Paul J. Lennon, Chief Safety Officer and Administrator - Safety Audit Programs
American Public Transit Association
Washington, D.C.

Harvey W. Becker, Lead Rail Safety Auditor
American Public Transit Association
Washington, D.C.

D. Scope of Report

The Panel members inspected the accident scene during the afternoon and evening of Saturday, December 19, 1992, and convened on the morning of December 20, 1992, in the office of BART's System Safety Manager. The full cooperation of BART was placed at the disposal of the Panel.

The Panel met with BART General Manager, Frank Wilson, who requested the Panel to provide a comprehensive assessment of the causes of the accident, findings, and specific recommendations.

It was agreed that the Panel would provide a verbal report to the General Manager at the conclusion of the site investigation and a final report upon completion of the Panel's assimilation of all information and documents required.

The Panel also met a second time in May, to obtain additional information and to clarify previously supplied operating practices and procedures.

III. ACCIDENT INVESTIGATION

A. Investigation Process

The Panel of Inquiry process began by reviewing the materials provided by BART officials and receiving a formal presentation by BART as to the accident scenario, equipment and maintenance practices. BART staff gathered facts and details through video tape, photos, diagrams, and interviews with passengers and employees who were involved. This information proved to be invaluable to Panel members who arrived a day after the accident occurred. The document review was followed by physical examination of the accident site, inspection of the car equipment (the cars were removed to Hayward Yard prior to arrival by the Panel of Inquiry), and track work involved in the derailment.

During the initial investigation and follow up meeting in May, the Panel conducted interviews with the following BART staff whose activities and responsibilities related directly to factors involved in the derailment:

R. Aquilera, Automatic Fare Collection Technician
D. Chris, Equipment Engineer
P. Couter, Central Supervisor
R. Crist, Mechanical Engineer
R. Franklin, Train Controller
J. Gallagher, Assistant General Manager, Operations
L. Guild, Train Operator
Sgt. N. Joe, BART Transit Police
D. Johnston, Mechanical Systems Engineer

J. Leone, Train Operator
V. Mahon, Manager Power and Way
P. Oversier, Chief Transportation Officer
F. Stevens, Department Manager-Rolling Stock and Shops
R. Weule, Executive Manager of Safety and Investigations
R. White, Deputy General Manager

In addition to the APTA Panel of Inquiry, the accident also was investigated by the National Transportation Safety Board (NTSB) and the California Public Utilities Commission (CPUC).

The Panel's mission was to determine why the train 278 traveling southbound on track C1 of the Richmond - Fremont line derailed at approximately 11:21 p.m., Thursday, December 17, 1992, south of the 12th Street-Broadway Station while programmed for a diverging route over switch #153.

B. Investigation Findings

Scenario

Train 278 was scheduled to operate from Richmond (R60) to Fremont (A90) to Richmond (R60). On the incident evening train 278 departed the Richmond Yard en route to Fremont at approximately 10:51 p.m. The run proceeded normally until the train approached the 12th Street Station where the train was routed to the upper level platform. The run was to test an alternate route to Fruitvale Station in preparation for maintenance work that was to be performed on the lower level tracks during January 1993.

nce work that was to be performed on the lower level tracks during January 1993.

Public address announcements informing passengers on the lower level of this change were made by OCC. The announcements may not have been understood or made in time for passengers on the lower level platform to move to the upper level which appears to account for the smaller than usual number of passengers on train 278 at the time of the derailment.

Train 278 made a normal station stop at the upper level platform in the 12th Street Station at 11:19 p.m. It departed the station at 11:20 p.m. and entered interlocking A05. Switch #153 had been programmed reverse to establish a left-hand turnout from track C1 at 11:15 p.m. The average speed attained by the train during this move was calculated to be 15.5 mph which is within design standards of 18 mph for a #8 turnout, as specified in BART's Train Control Track Plans.

The derailment occurred when the lead truck of car #753 derailed and pulled the trailing truck of car #676 off track C1 at switch #153. Examination of the accident site revealed that the right-hand switch point and stock rail were severely worn. At a point 18-24" south of the point of switch, the #2 wheel, which also was severely worn, climbed the switch point and rode along the top of the stock rail before falling onto the road bed and continuing to travel along track M2 in a derailed condition.

System Description

The San Francisco Bay Area Rapid Transit District (BART) operates a 71-mile heavy rail transit system. It consists of at-grade construction, aerial structure, underground construction and underwater tube linking San Francisco with Oakland. There are 34 stations on the system.

The system includes 589 rail cars designed to be operated in an automatic mode with little operator intervention required. BART's Automatic Train Control provides a failsafe train protection system with central supervisory functions, including fully automatic train operations and automatic schedule adjustment. During reverse running, the cars may be operated in the automatic mode and are governed by the appropriate speed commands.

At the time of the derailment, train 278 was operating in the automatic train operation mode under supervision of the OCC.

Operations Control Center

Overseeing train and wayside operation is the OCC, located at BART's Lake Merritt headquarters. The OCC provides supervision over all phases of operation, including trains, patrons, traction power, and wayside equipment. The Central Supervisor is responsible through controllers for all functions that support operations, testing, and maintenance on the main line. The OCC also coordinates assistance for difficulties encountered with mainline vehicles, stations, and wayside facilities.

The OCC selected train 278 to operate on the run between the MacArthur and Fruitvale Stations on the Richmond-Fremont line. Although train 278 deviated from its normally scheduled route during the reverse running move, the movement was computer controlled and did not require communications with the OCC.

Car Equipment

Four of the six (6) cars of train 278 were manufactured by Rhor Corporation of Chula Vista, California. Car #1 was an "A" car measuring 75'0" in length and 10'6" in width. Cars #2, #3, and #5 were "B" cars measuring 70'0" in length and 10'6" in width. Cars #4 and #6 were "C" cars, measuring 70'0" in length and 10'6" in width and manufactured by the French firm Soferval. All cars are constructed of aluminum.

The Panel members focused on car #676 "Y" truck and car #753 "X" truck. These were the only trucks of the six-car train to derail. The Panel examined the cars, interviewed BART personnel, and reviewed car documents and records which identified the following issues.

The #6 wheel of car #676 ("Y" truck) measured a 0-8 (15/16") flange thickness. This is the minimum thickness for wheels in service as per the AAR Manual of Standards and Recommended Practices, Section G - Part 2, Specification 2F17 effective October 1, 1989, and revised April 1, 1991. This wheel was borderline

as per BART's Wheel Measurement and Limit Procedure 3-7, Item 2A1.

If wheel measurements were taken with the AAR 1976 finger gauge, the wheel would have been out of service per BART's maintenance procedures. BART wheel maintenance personnel use a Go/No-Go gauge (#700) to determine condemning limits. The Go/No-Go gauge (#700) allows for more leeway in interpretation. Wheels #5 and #7 had measurements of 0-7 ("1") flange thickness. In addition, Incident No. E032382M, dated November 16, 1992, reported a 2-3" bubble in the #6 air bag of car #676. Disposition was to defer replacement until the next truck change.

The #2 wheel of car #753 measured a 0-7 ("1") flange thickness and wheel #4 measure a 0-6.5 (1-1/32") thickness. One small flat spot was noted on wheel #2 that probably was a result of the accident. Both wheels had a sharp metal knife edge build up on the flanges. The flange vertical and height readings were within specifications on both cars.

The centering pin of car #753 was examined immediately after detrucking. No evidence of binding or abnormal wear marks were found. The Panel members were unable to inspect the centering pin of car #676. However, the bolster receiving hole exhibited no unusual markings. The damage to the under car equipment was extensive, but no indications were present to indicate that loose or hanging equipment contributed to the derailment.

BART operates its fleet by assigning cars to operate on specific lines. The cars usually operate back and forth over the assigned line for extended periods of time. Although turning cars is a departmental responsibility, BART has not established a system-wide requirement for regular periodic turning of its fleet. This may result in wheels on the same axle and truck developing unequal wear patterns that would not normally occur if the cars were operated on more than one line or periodically turned around.

Track Condition

The derailment occurred at interlocking A05 in the Oakland Wye. The turnout where track C1 joins track M2 is a #8 turnout as detailed on San Francisco BART District Contract 1Z4481-2448 Sheet No. TT205-3, page #3. All rail is 119 CF&I Section. Tie plates are standard AREA plates with 1/4" thick pads. Ties are 7"x9" timber anchored to the reinforced concrete invert slab.

Switch #153 is a 19'6" curved split switch (AREA standard plan #124-55, Spec. 124c) modified for 5'6" gauge. Switch point details are per AREA Plan #221-62 detail R500 (commonly referred to as Samson under cut design). Rail braces are bolted adjustable as manufactured by Abex Corporation. Heel blocks are floating heel blocks per BART reference Drawing ST-494D.

Based on the Panel's investigation and information supplied by BART staff, the switch condition at time of derailment measured approximately 5/8" gauge cor-

ner wear on the right-hand stock rail approaching the point of switch. The right switch point appeared from photographs to have almost a knife edge, and about 24" from the point of switch a chip was evident. However, BART staff stated that the switch point had been ground prior to the Panel's arrival in preparation for restoration of service.

The curve closure rail was side-worn approximately 5/8" as measured by BART personnel. The approximately 5/8" wear on the right-hand rail through the turnout and through the frog continued until reaching a restraining guard rail attached to the left rail (low rail). The restraining guard rail has aided in reducing high rail wear.

The Panel directed that after the right-hand stock rail, switch point and curved closure rail were removed from the track, they be steamed cleaned and reassembled for further inspection. No other changes were to be made. The stock rail and switch point were to be reassembled and clamped together for inspection at the Oakland Shop. At that inspection the Panel was unable to see the sharpness of the switch point edges because additional grinding was performed on the switch point after its removal from the track.

Track Maintenance and Inspection

A review of the Train Control Division records, preceding the derailment, revealed that switch inspections and required maintenance was up-to-date and in accordance with Bay Area Rapid Transit

District, Train Control Division Manual, effective July 1, 1976.

The Panel reviewed BART's "Track Maintenance Procedures, Track Inspection" revised January 1992. The required monthly track and switch inspections were performed preceding the derailment. The quarterly switch measurement was performed March and June 1992, but the record of September 1992, was not available.

BART's standard for rail wear was provided verbally to the Panel by BART staff and is as follows:

1. When rail side-wear reaches 1/2", the track inspector reports the track as a Priority Code No. 2 (routine maintenance-preventive maintenance). Once the Priority Code No. 2 is placed on the track, the track supervisor II is responsible for scheduling and managing the replacement of that rail. The side-wear is compared with past history of about 1/8" to 1/4" wear per year.
2. When rail side-wear reaches 3/4", the track supervisor II places a Priority Code No. 3 on the track (commence work at the next maintenance window). Again wear is monitored using past history and inspections by the track supervisor.
3. When rail side-wear reaches 1", the track supervisor II places a Priority Code No. 4 on the track. (schedule and commence work immediately).

Bart's standard for rail wear does not take into account the angle from vertical the wear has created. This criterion is based on wheel climb associated with lateral to vertical force ratio. European standards, where this parameter is frequently used, limits range from 26 degrees¹ to 32 degrees².

A review of the March 18, 1992, and June 18, 1992, Quarterly Switch Measurement Reports for switch #153 reported rail wear on the turnout side. The March 18 report noted work request No. 10126 established a Priority Code No. 2. A comparison of the two (2) reports reveals 3/8" wear at one location within a three month period.

Reference is made to Racor Products, Operating and Maintenance Manual, BART Contract 11D\SD-213-A, issued March 6, 1986, *Section 4.2.1.5 Thin Switch Points*: "This problem (thin switch points) results from predominate heavy diverging traffic. Cracks will develop or chips may break out. This condition can result in a wheel flange climbing the point." If the previously mentioned chip existed prior to train 278's arrival, it could have been the cause of the derailment. Records show the Train Control Division performed a monthly inspection on December 15, 1992. Their report did not mention the chip; therefore, we can assume that the chip occurred after the inspection or at the time of derailment.

The latest Track Geometry Car run was October 7, 1992, and all parameters were satisfactory in the vicinity of the derailment.

Sperry Rail service preforms the ultrasonic rail testing for BART twice a year. The latest ultrasonic rail testing was performed between June 26 and July 2, 1992. No defects were found in the vicinity of the derailment.

Train and Track Interaction

Track and car maintenance personnel stated to the Panel that they each maintain their equipment to applicable Federal Railroad Administration/American Railway Engineering Association/American Association of Railroads standards. The wear on rails and wheels were within these standards, albeit at their outer limits in both instances. It is important to analyze where these standards are being applied i.e., in switches versus curved track, if one is to determine and apply them to a particular situation. FRA standards, for example, apply to railroad operations whose operating environment is considerably different from the rapid transit environment. These standards provide a good starting point but may need to be revised to reflect a property's actual operating experience.

Rules and Procedures

Review by Panel members of the radio transcripts and emergency phone communications indicated inconsistent application of rules: Part I, Section 7, Rule 712, Item B, Operating Instructions, Paragraph #2, states when using emergency telephones, "identify yourself by giving the emergency telephone box number and your name before stating your business." (See Appendix 3) Immediately following

the derailment, numerous communications were interrupted by OCC trying to inquire who was calling, and many of the calls received did not identify the call origination.

Reception on radio channel #1 was very poor with several transmissions not understandable or requiring repeating. Specifically, the transcript of the Power and Way Maintenance Radio transmissions contained numerous repeats and unanswered calls. For example, it took over 35 minutes for OCC to contact field unit T58.

Upon derailment, the train operator of train 278 reported that all annunciators were illuminated, indicating an overload. He then left the cab and began evacuating passengers prior to notifying the controller of the extent of the accident and receiving acknowledgement of third rail deactivation.

The Panel's review of the initial communications between the controller at OCC and the train operator indicated neither party realized the train had in fact derailed, and assumed that only an "overload" had occurred. As a result, the emergency braking was not activated to minimize damage to BART property and patron injury. The train operator indicated he had experienced many of these "overload" occurrences during his tenure with the BART system and did not consider immediate evasive action by activating the emergency train braking.

Rule 602 requires that "employees shall report any emergency condition

immediately to Central, Yard Control, or BART Police Services, as appropriate, providing as much information as possible." (See Appendix 3)

The Panel's evaluation of the events indicated the train operator properly observed the directional arrow indicating the route intended for train 278. This is evidenced by the lead portion of the train safely operating over switch #153 and only the trailing cars being impacted in the derailment. However, the train operator should have realized the magnitude of what was occurring by the pronounced shaking motion of the train, especially while operating over a track switch.

The train operator of train 278 was not sent for a drug/alcohol test. It was determined by an on-scene supervisor, after an interview with the operator, that a drug/alcohol test was unnecessary. This process was consistent with BART's established drug policy.

During the Panel's investigation, a review of the OCC Procedures Manual found conflicting information is provided regarding delegation of authority during emergency incidents. Chapter II, Section I, Item 202 of the manual, issues overall authority to OCC, stating, "This authority and responsibility shall not be transferred nor relinquished and is not compromised under revenue, maintenance, or emergency conditions." (See Appendix 3) Chapter II, Section 4, Item 281 of the manual, states, however, that "Field Services will be the department in charge during an emergency incident." (See Appendix 3)

During the Panel's follow-up visit, the members were informed that the OCC Procedures Manual was in the process of being revised.

Emergency and Accident Investigation Response

The overall emergency response was accomplished in accordance with BART's Emergency Plan including establishment of an on-scene coordinator, emergency operations center, and on-scene command post. The Emergency response was supported by efforts of the train operator, station agent, and the Automatic Fare Collection technician on board the train. Patrons were evacuated quickly. Injured patrons received medical attention at the scene and were evacuated to the 12th Street Station before being transported to local hospitals.

In responding to the derailment, the Panel found that the BART Emergency Plan appears to have been executed properly during the accident. Although there was some initial confusion on the exact location of the accident, BART personnel and Emergency Response personnel from the Oakland Fire Department and other support agencies responded in a timely manner and carried out their respective duties. An exception was that passengers tried to egress via a BART emergency subway exit, after the derailment, but found a dumpster on top of the exit doors, thereby preventing their exit.

Arrangements for "bridging" the service disruption area utilizing bus service was accomplished in a timely manner and

appeared to be very effective. Limited train service was re-established as soon as it was safe to do so in the vicinity of the derailment. The handling of passengers and providing information to the public appeared to have been handled effectively.

The BART Police Department performed the official investigation of the accident, and representatives from all levels of management were present at the scene.

Important evidence involving the switch point was altered at the accident scene as the result of BART's preparations to restore revenue service. When later removed from the derailment site for further examination by Panel members, any usefulness as evidence was further compromised by additional grinding performed at the Oakland Shop.

Because all evidence was not preserved in a secure environment, free from tampering and unauthorized modifications prior to examination, the Panel was not able to determine if any other contributing factors existed.

IV. FINDINGS

Based on the investigation of the Panel of Inquiry, the following findings were developed.

Track

- The right-hand switch point, stock rail and curved closure rail of switch #153 had 5/8" side wear.
- Examination of photographic evidence indicated that the right-hand switch point showed significant wear, appearing to be a knife edge although this cannot be confirmed, due to the grinding of the switch point prior to the Panel's arrival on the scene and additional grinding after the switch point and stock rail were removed from the track.
- Track wear maintenance standards are inadequate. The track maintenance standards are confusing and, in places, refer to different criteria.
- All track fasteners, ties, and the frog in the area of the incident were in good condition.
- The switch rods showed no damage due to the derailment.

Car

- The #2 and #4 wheels of the lead truck of car #753 were approaching their wear limits and evidenced unusual wear patterns.

- Several wheels of cars #676 and #753 were found to be near or at the condemning limits of BART's standards.
- Wheel wear maintenance standards are inadequate.
- No system-wide policy exists for the turning of rail cars to help equalize wheel wear.
- BART's current practice is to turn wheels only when they reach the condemning limit, develop a flat spot, shelling, or any other abnormality.
- Many of the annunciator lights for identifying trainline problems are contained in a cabinet at the opposite end of the car from the operating cab.
- Car maintenance has a single wheel truing machine located at the Hayward Shop and requires transferring of cars for wheel turning maintenance.

Operations

- The train operator failed to comply with Rule T-407(A)(5), for failing to ensure deactivation of third rail power prior to initiating evacuation procedures. (See Appendix 3)
- The train operator failed to comply with Rule 602, failing to secure

authority from the controller prior to evacuating passengers from the train.

- It was not apparent from the train operator's actions, testimony, OCC tapes or other evidence that he was immediately aware of the nature of the problem.
- The train was operated in automatic mode in accordance with speed commands during reverse running.
- The preservation of evidence, although covered in BART's procedures, was not strictly adhered to.
- There are inconsistent procedures or formats for utilizing radio and emergency phone communications.
- The train operator was not tested for drug and alcohol.
- The OCC procedures manual is not up-to-date and consistent with current practices. The Panel learned, however, during its second visit, that this manual is in the process of being updated.
- No standard reporting procedure exists for reporting specific locations on the system, causing confusion as to the exact location of the derailment.
- No specific procedure exists requiring the train operator to initiate an

immediate stop at maximum brake application upon experiencing an unusual train operation.

- The radio communications system exhibited some deficiencies, and the 12th Street PA did not function as intended to provide passenger information.
- Information relevant to location, track numbers, and third rail sections is not located in the vicinity of subway emergency phones for identifying emergency related information to OCC.
- The emergency response by fire and rescue personnel was handled effectively and efficiently.

Train Control/Signals

- The automatic train control and signal system functioned as designed.

V. PROBABLE CAUSE

The American Public Transit Association Panel of Inquiry believes the probable cause of this accident was that wheel #2 of car #753 climbed the right-hand switch point of switch #153 and derailed.

Contributing factors in the derailment were:

1. Wheel #2 on car #753 was worn to 0-7 (1") flange thickness which is near BART's condemning limits with a hollow tread and false flange. This condition tended to steer the truck to the right even though the switch point was trying to turn the wheel left. This rightward movement created additional forces between the wheel flange and rail.
2. Comparing wheel #2 profile to the rail profile at 24" from point of switch reveals almost the entire wheel flange was in contact with the rail head. This created a tremendous frictional force allowing the flange to climb up the rail and onto the stock rail.
3. The sharp knife edge built up on the flange of wheel #2 conceivably was the cause of the chip on the switch point 18" to 24" from the point of switch. The profile of wheel #2, car #753 supplied by BART personnel did not include the metal built up on the flange, but it was very close to the location at the top switch point, thus a significant contributing factor to aiding the wheel flange to climb the rail.
4. The rail was worn 5/8" at gauge line and the rail wear angle from vertical was approximately 25 degrees.
5. The two lead cars had completed the left turn move through the switch point and were pulling wheel #2 of car #753 leftward but the three (3) cars behind car #753 were pushing straight thus assisting wheel #2 to climb the switch point and stock rail ultimately falling down onto the track-bed between the gauge of track M2.

VI. RECOMMENDATIONS

The Panel of Inquiry offers the following recommendations for the consideration of BART management to assist in preventing a recurrence of the derailment of December 17, 1992, and to improve the safety performance of the system in general.

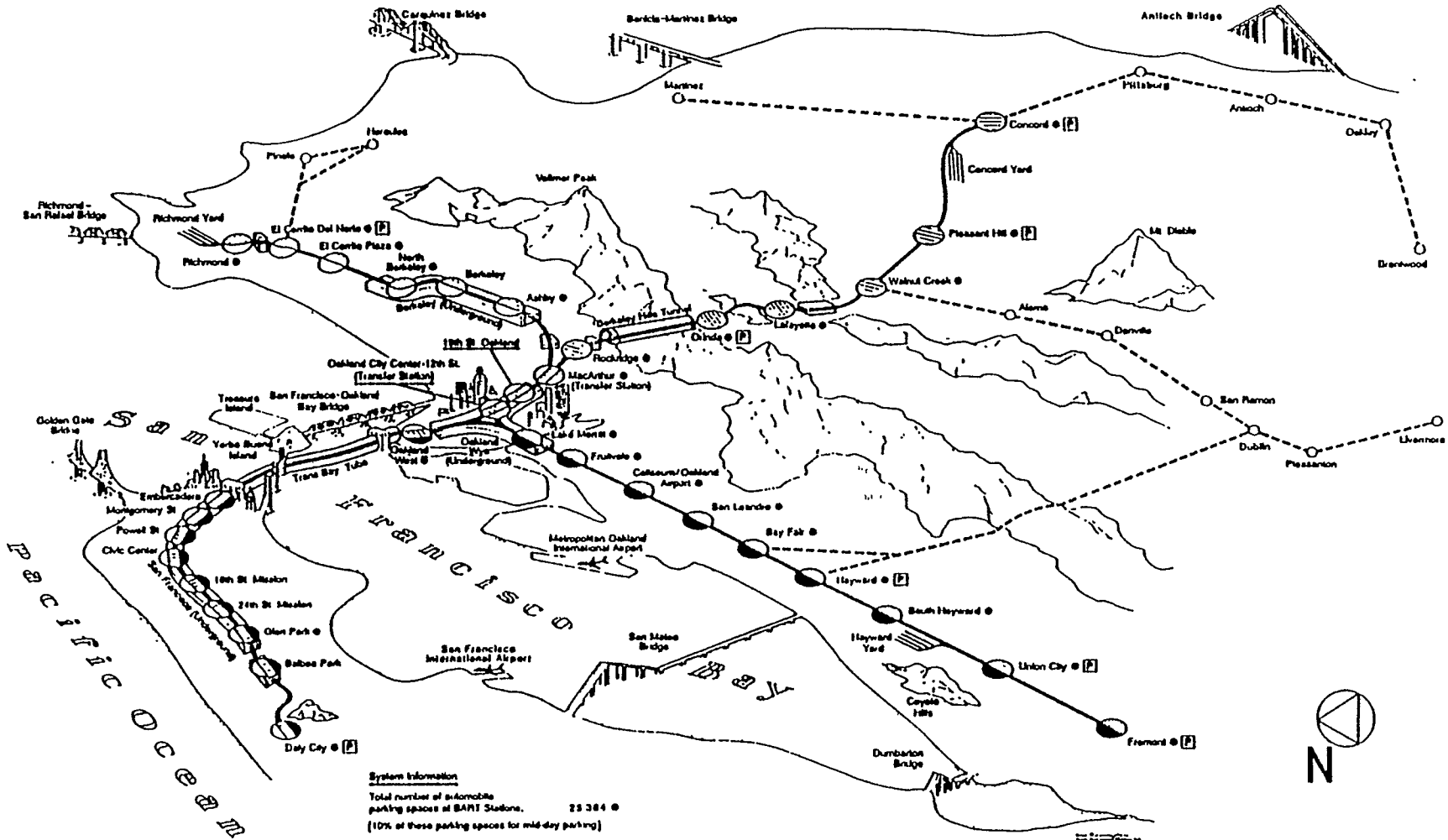
It should be noted that many of the recommendations are already under study by BART. In regards to the actions immediately taken by BART management following the derailment, the Panel is in agreement that these steps are in the best interest in providing the safest possible transportation for its passengers.

Recommendations:

1. BART should re-evaluate its track wear standards.
 2. BART should re-evaluate its wheel wear standards.
 3. BART should investigate the effects that BART light transit cars have with regard to wheel/rail forces and contact pressures as well as the ability of powered wheels to climb up and over running rails.
 4. BART should ensure that truing during the life of the wheel occurs at a predetermined point.
 5. BART should discontinue use of the GO/No-GO wheel gauge. BART should perform all wheel measurements with the AAR steel wheel gauge - 1976.
 6. BART should establish a system-wide policy for turning of cars to reduce unequal wheel wear patterns.
 7. BART should investigate the adequacy of its wheel truing capacity.
 8. BART should establish an independent maintenance audit.
 9. BART should incorporate responsibility for preserving evidence into the Emergency Response Manual.
 10. BART should establish tighter procedures to impound evidence for investigations.
 11. BART should review current Drug Policy with comparable transit properties to ensure their "post accident" testing is consistent with industry practices.
 12. BART should establish and enforce standard radio communication terminology, protocol and procedures.
 13. BART should expedite, distribute, and implement the revisions to the Central Procedures Manual which are presently underway, to eliminate potential conflicts.
-

14. BART should consider providing annunciator indicators in the operating cab.
15. BART should implement a rule to explain the application of emergency braking.
16. BART's OCC procedures manual should be revised so that train operators are advised of changes to their route if that route differs from that which is normally operated by that train.
17. BART should inspect all emergency exits periodically to ensure that they are free of obstructions.
18. BART should review the maintenance program for all communications systems to ensure reliable operation.
19. BART should provide an area identification diagram adjacent to each subway emergency phone.

APPENDIX 1 BART SYSTEM MAP



System Information
 Total number of automobile parking spaces at BART Stations. 23,384
 (10% of these parking spaces for mid-day parking)

(Line Miles)

A Line—(Fremont to Lake Merritt)	23 Miles
M Line—(Daily City to Oakland West)	15 Miles
R Line—(Richmond to MacArthur)	12 Miles
C Line—(Downtown Oakland to Concord)	21.5 Miles
Total Miles	71.5 Miles

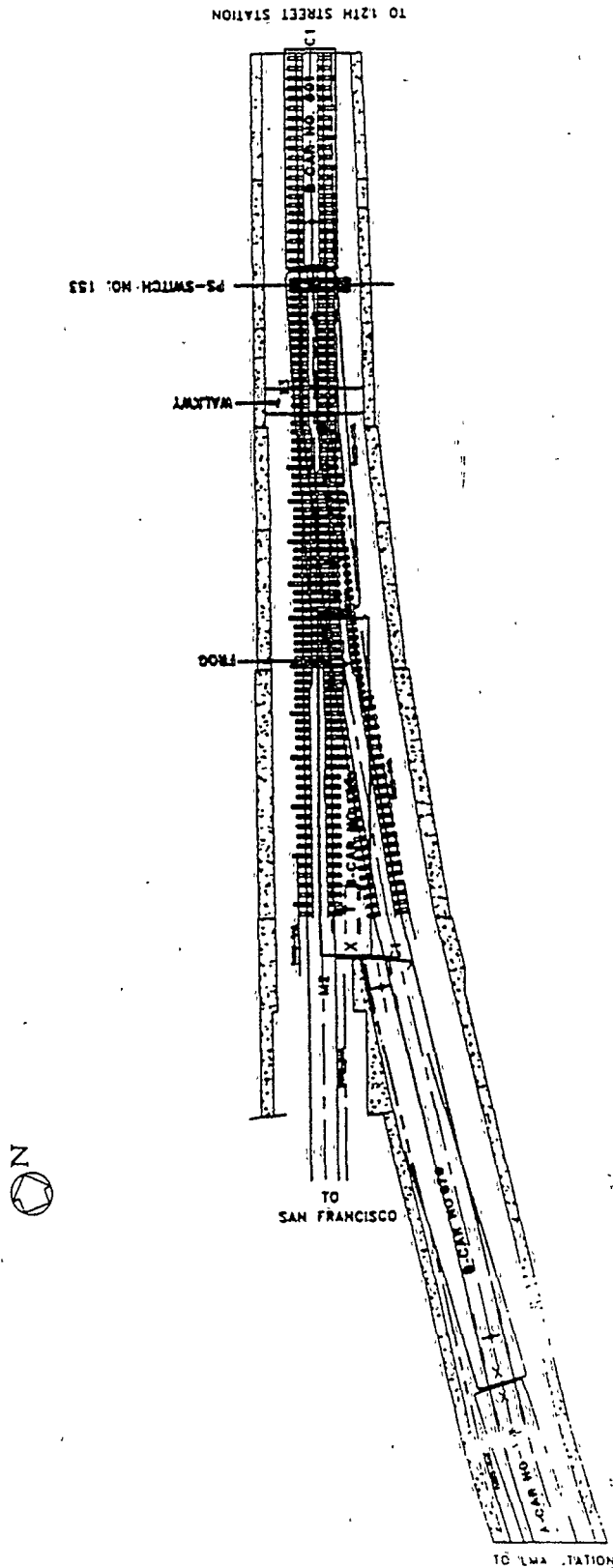
(All miles are calculated from the Oakland YVE)

- CONCORD/DAILY CITY (INC) BAYRD/DAILY CITY (INC) BAYRD/FREMONT FREMONT/DAILY CITY
- BART Express Bus
- Parking
- Preferred Carpool Parking
- BART Red System



BART SYSTEM MAP

APPENDIX 2
TRACK LAYOUT AT SWITCH #153 OAKLAND WYE



A05 DERAILMENT 12/17/92

APPENDIX 3

APPLICABLE BART RULES, REGULATIONS, PROCEDURES

Source: BART OPERATIONS RULES
& PROCEDURES MANUAL

RULE 712(B)(2):EMERGENCY TELEPHONES

When calling on the emergency telephone system, identify yourself by giving the emergency telephone box number and your name before stating your business.

RULE 602: EMERGENCIES

Employees shall report any emergency condition immediately to Central, Yard Control, or BART Police Services, as appropriate, providing as much information as possible.

RULE T-407(A)(5): TRANSIT VEHICLES OPERATIONS

Whenever a requirement exists to inspect the exterior of a train on mainline the necessary protections shall be provided and the third rail shall be de-energized, if required. In all cases the train operator shall be advised of the third rail power status and protections provided prior to disembarking the train.

Source: BART CENTRAL GENERAL
RULES AND PROCEDURES

CHAPTER II, CENTRAL GENERAL RULES AND PROCEDURES

SECTION 1: GENERAL RULES AND PROCEDURES

202. Authority and Responsibilities

1. Central Control has overall authority and responsibility for movement of all vehicles, train operations, activities on mainline trackways, and remotely controlled or monitored systems within its jurisdiction. This authority and responsibility shall not be transferred nor relinquished and is not compromised under revenue, maintenance, or emergency conditions. The Central Supervisor is the person within Central Control charged with this authority and responsibility.

SECTION 4: EMERGENCY PROCEDURES

281. Emergency Chain of Command

1. Among district departments, Field Services will be the department in charge during an emergency incident.

1. Sperring, D.G. and Squires, J.H., "Rail Wear and Associated Problems," First Track Sector Course (Railway Civil Engineering), Railway Industry Association of Great Britain, 1983

2. Esveld, C., Modern Railroad Track, MRT Productions, Duisburg, kWest Germany, 1989

1. Sperring, D.G. and Squires, J.H., "Rail Wear and Associated Problems," First Track Sector Course (Railway Civil Engineering), Railway Industry Association of Great Britain, 1983

2. Esveld, C., Modern Railroad Track, MRT Productions, Duisburg, kWest Germany, 1989



BAY AREA RAPID TRANSIT DISTRICT
800 Madison Street - Lake Merritt Station
P.O. Box 12688
Oakland, CA 94604-2688
Telephone (510) 484-6000

September 7, 1993

NELLO BIANCO
PRESIDENT

MARGARET K. PRYOR
VICE-PRESIDENT

FRANK J. WILSON
GENERAL MANAGER

DIRECTORS

DAN RICHARD
1ST DISTRICT

NELLO BIANCO
2ND DISTRICT

ROY NAKADEGAWA
3RD DISTRICT

MARGARET K. PRYOR
4TH DISTRICT

SHERMAN LEWIS
5TH DISTRICT

JOHN GLENN
6TH DISTRICT

WILFRED T. USSERY
7TH DISTRICT

JAMES FANG
8TH DISTRICT

MICHAEL BERNICK
9TH DISTRICT

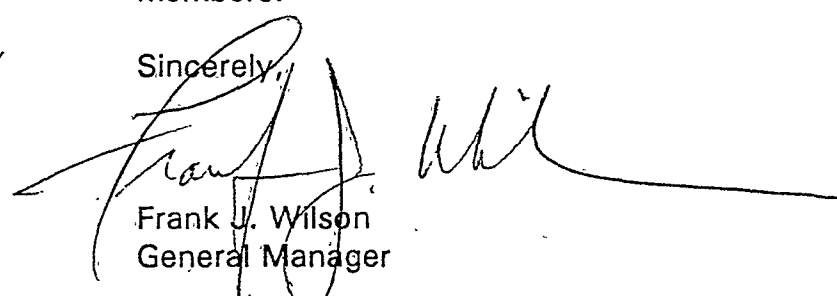
Mr. Frank J. Cihak
Chief Engineer and
Deputy Executive Vice President
Technical Services
American Public Transit Association
1201 New York Avenue, N.W.
Washington, DC 20005

Dear Mr. Cihak:

We have received the final report of the APTA panel of inquiry for the December 17, 1992, derailment. BART has studied these recommendations and our response is attached.

Once again, thank you for the work of your staff and the panel members.

Sincerely,



Frank J. Wilson
General Manager

Attachment

cc: Langley Powell

**BART RESPONSE TO THE AMERICAN PUBLIC TRANSIT ASSOCIATION'S
RECOMMENDATIONS CONTAINED IN ITS FINAL REPORT OF THE
DECEMBER 17, 1992 DERAILMENT**

1. BART agrees and has taken a more conservative approach regarding its track wear standards—changing the criteria from 3/4 inch gage face wear to 5/8 inch gage face wear—until an outside maintenance audit can be completed.
2. BART agrees and is implementing more conservative criteria for wheel wear standards until a maintenance audit is completed. Currently, our maximum wheel wear criteria is flange size #7, and we are in the process of removing all wheels from service where the flange size has reached #7. We will further reduce the allowable amount of wheel flange wear by adopting a criteria of #6 or higher. BART is also changing its maintenance approach to a preventive (or scheduled) reprofiling program rather one based only upon the observed condition of the wheel.
3. Zeta-Tech of Cherry Hill, New Jersey, an independent consulting firm, has completed its report and analysis of BART wheel and track dynamic factors related to the derailment and presented its findings and recommendations to appropriate BART staff. District staff are working to include Zeta-Tech's recommendations in our rail inspection process. The intent of Zeta-Tech's wheel recommendations will be reflected in BART's revised maintenance program.
4. BART agrees and is changing the wheel maintenance program to true wheels more frequently (in the range of flange size #3 to #6). To implement this program, the District is acquiring new high production wheel truing machines which will improve current wheel truing capacity.
5. As stated in #2 above, BART is moving towards a more conservative wheel wear criteria of flange size #6 for all wheels. We are purchasing electronic gages (which are more accurate than our current hand held steel gages) for each shop and will continue to use the GO/NO-GO gages until we receive the new electronic gages.
6. The District has formalized its program for turning the fleet. We turned the entire fleet in the summer of 1993, and the fleet will be rotated periodically based upon criteria to be developed.
7. The District is in the process of replacing the existing wheel truing machine with new, higher capacity wheel truing machines. The new machines will substantially increase the District's wheel truing productivity.

8. BART agrees and has developed a scope of work for an outside study of maintenance standards. A complete, independent outside maintenance audit will follow as soon as a scope of work for this project can be developed.
9. Both the BART Emergency Plan and the Operations, Rules and Procedures Manual have been revised to insure compliance with procedures for preserving and impounding evidence of an accident or incident.
10. Same as #9.
11. BART'S Drug and Alcohol policy for post accident testing is consistent with industry practices for comparable properties. BART will comply with the new DOT regulations which are due out within 12 months and will strengthen our procedures for post accident testing during collective bargaining next year.
12. BART'S current standards for radio communications terminology, protocol, and procedures are appropriate. BART will reinforce these procedures with all Operations employees.
13. The Central Procedures Manual has been revised. One revision updates Department name changes so that persons unfamiliar with current practices will not be confused.
14. BART trains currently have annunciators in the operating cab. This recommendation is confusing.
15. The application of emergency brakes is addressed in the Train Operators Manual. The District considers these procedures adequate. These procedures will be reemphasized with Train Operators during recertification training.
16. According to the Operation's Control Center recorded voice tapes, the train operator was notified in advance of the route deviation. This procedure is already a BART standard operating policy, and has been in place for several years. It is also being added to the Central Manual.
17. A check of all emergency exits is a current BART policy. BART has, however, increased the frequency of the inspections.
18. BART is currently reviewing the maintenance communications procedures. The entire communications system is scheduled for replacement in 1995. In the interim, BART will do a communications audit.
19. BART is currently reviewing the recommendation to provide diagrams adjacent to each subway Emergency phone. Currently, an alarm is sounded in the Operations Control Center when and Emergency phone's receiver is lifted. Additionally, the Emergency phone's unique location in the system is displayed at the power/support console.

Tuesday, September 14, 1993

BART searching for cause of post-accident confusion

BY KATHERINE CORCORAN
Mercury News Staff Writer

While BART officials were swift to give a preliminary cause for last week's train derailment, they are still searching for the root of a communications breakdown that left thousands of rush-hour commuters stranded and confused after the accident.

"We're trying to figure out what we can do so that doesn't happen next time. There were glitches in the information flow," BART spokesman Mike Healy said Monday. "The station agents were not getting information. . . . We announced that there was a bus bridge in place, and for a while there were no buses."

Human error is believed to have caused the derailment of a 10-car train Friday afternoon at an Oakland storage track north of the 19th Street station. The train was out of service and carrying only the train operator, who was not injured.

BART officials said the empty train was "moved prematurely," triggering a built-in safety mechanism that knocked a wheel off the track to keep the train from rolling onto the main line and colliding with in-service trains.

The derailment, which knocked out the automatic train control system, closed BART on the

Richmond line between the West Oakland and Ashby stations and on the Concord line between West Oakland and Rockridge. AC Transit normally runs extra bus service between stations when BART breaks down.

"They were delayed somehow in being activated and dispatched," Healy said.

He also said train operators and station agents were getting conflicting information about how to redirect passengers. And the broken-down train control system created computer problems with train destination signs, which conflicted with announcements on the public address system.

"It gets very busy in central (communications), where main announcements come from," Healy said. "We want to look and make sure there's a good solid link from the information source to . . . train operators and station agents."

The derailed train's operator, who has about six years of experience at BART and a good record, has been put on unpaid administrative leave pending the final outcome of the investigation, Healy said. She was tested for drugs and alcohol after the accident, though Healy said substance abuse is not suspected. He would not release her name.

Commuters complain of confusion

Misinformation worsens BART derailment woes

By ROBERT OAKES
Staff writer

OAKLAND — After an epic failure to communicate last week, BART will re-examine how it explains delays to passengers.

Thousands of passengers complained about a lack of information or clear directions Friday after an out-of-service train derailed in Oakland just as the evening rush hour began.

Transit officials promised Monday to study how to do better.

"We need to advise people and direct them so we don't have that kind of chaos," said BART board President Nello Bianco, who requested the review.

Human error caused the derailment, said BART spokesman Mike Healy. A train operator went too fast and hit a fail-safe device that knocked one wheel off a siding, Healy said.

BART managers are still trying to determine what created widespread communication problems, Healy said. The transit district has been criticized before for similar foul-ups.

BART board Director Dan Richard of Orinda said that misinformation was "totally unacceptable." He promised to push for better performance.

"I'm not satisfied," Richard said. "I don't think anybody at BART is satisfied or should be. There is no place for this confusion."

Many passengers stuck at the 12th Street station in downtown Oakland were told that they could catch AC Transit buses to the MacArthur station, where some trains were still operating. More than an hour passed before the "bus bridge" started.

"People went up there looking for buses, and they weren't there," Healy said.

Crowds besieged station agents at 12th Street and demanded information. Many commuters said they couldn't hear or understand announcements on the public address system.

Healy said the BART manager in charge during the derailment admitted there was extreme confusion. Station agents did not always get accurate or timely messages from BART central control.

BART conducts extensive reviews after any delay. The communications misfire will receive special attention this time, Healy said.

The empty train derailed on a siding in the Interstate 980 median. The operator was moving the 10-car train from a spur track onto the siding, where the train could enter rush-hour service when needed.

A BART computer controls the trains at most times; but the operator was controlling this train during a maneuver that requires low speed, Healy said.

The train hit the derailing mechanism, which prevents a train from accidentally leaving a siding in the wrong direction and colliding head-on with a train on the main track. The impact forced a wheel from a 63,000-pound car to jump off the siding.

The operator should have gone slower and stopped earlier, Healy said.

"Everything worked like it was supposed to work," Healy said. "We determined that human error was likely the cause."

The derailment happened in the worst possible place at the worst possible time. A main electric cable was knocked out and shut down all power at the central connection point in the 71.5-mile system.

'Everything worked like it was supposed to work.'

— Mike Healy,
BART spokesman

Operator Blamed for Derailment

**BART manager says error
likely cause of accident**

*By Rick Del Vecchio
Chronicle Staff Writer*

Friday's nightmarish BART commute was the likely result of an error by a BART train operator, according to the system's general manager.

BART manager Frank Wilson said yesterday that the operator accidentally ran a train over a collision prevention device that kicked the wheels of an empty train off a service track in Oakland. That knocked out a cable that enables major parts of the system to run automatically.

He said the operator, an unidentified woman with a number of years of experience in the job, overshot the device by more than 100 feet.

"The early indication is operator error," he said. "We'll know definitely in a couple of days."

The operator, who was checked out at a hospital but was not hurt, has been placed on administrative leave.

The accident happened on a spur parallel to the Richmond and Concord lines between the 19th Street and MacArthur stations. The 10-car train, with no one on board but the operator, was supposed to have reversed direction when it neared a large iron block set in the track to prevent it from getting too close to a junction with the passenger lines.

The device is equipped with flared edges that are designed to push a wheel off the track. They did just that, causing no damage to the train but triggering a short circuit.

As a result, automatic controls were knocked out at a key junction in the system. Commuters were delayed between 20 minutes and an hour.

Repairs were finished yesterday, Wilson said.

BART attributes long breakdown to human error

Train operator put on administrative leave pending laboratory tests

By Don Martinez
OF THE EXAMINER STAFF

OAKLAND — Human error caused the BART train derailment that caused delays throughout the system Friday afternoon, BART said Monday.

The train operator has been placed on administrative leave without pay pending the results of laboratory tests to determine whether she was under the influence of drugs or alcohol, according to spokesman Mike Healy.

"The train was out of service and had no passengers except for the train operator," Healy said. "It was being moved onto a wayside so it could eventually be put on the mainline track, and that is where the human error occurred."

An automatic derailer, part of what Healy called "a fail-safe system designed to prevent head-on collisions," was activated even though no train was coming in the opposite direction on the same track.

Service returned to normal Monday, with only one minor mechanical problem that caused a 10-minute delay on the Richmond-Fremont line shortly after 7 a.m.

"Otherwise, all 42 trains were on schedule for the early Monday commute," Healy said.

On Friday afternoon, the commute became hopelessly snarled shortly before 3:30 p.m. Two cars of a 10-car train jumped off the track as the train was being moved to the storage track area north of Oakland's 19th Street station.

Nobody was hurt and Oakland firefighters quickly put out a minor grass fire caused by the derailment.

Thousands of BART riders were delayed for hours while crews worked to restore service. Downtown Oakland tracks were shut for more than two hours, and related electrical problems caused major disruption for hours throughout BART's 72-mile system.

BART struggles back to normal

Slight delays still reported on trains after derailment

By Steven A. Chin
OF THE EXAMINER STAFF

BART service returned to near-normal Saturday after Friday's derailment of an out-of-service train caused massive delays for thousands of evening rush-hour commuters.

Delays of five to 10 minutes Saturday were reported throughout most of the BART system because trains were "still on 'road manual' between 19th and MacArthur Boulevard," where trains normally are in automatic mode, BART spokeswoman Vicki Wills said.

"The trains are going very slow through that area," she added. "The train is still out there. We

haven't removed it from the track yet."

Some delays Saturday morning were due to an unrelated computer glitch that left destination signs on the platforms at three Oakland stations on the blink, according to Wills.

Signs at the 12th Street, 19th Street and MacArthur stations sometimes read "Concord" when the destination was San Francisco. Train service was not disrupted, but trains were traveling at reduced speeds in downtown Oakland, she said.

At 3:24 p.m. Friday, two cars of a 10-car train jumped off the track as the train was being moved to a storage track north of the 19th Street station. No passengers were on board.

Officials have not determined what caused the train to jump the tracks, BART's first derailment this year.

The accident caused no injuries,

but many riders were delayed hours while emergency crews worked to restore service. Downtown Oakland tracks were shut for more than two hours.

It took several more hours, however, for trains and buses to clear the backlog of people cramming station platforms.

Although the derailed train did not obstruct the main tracks, electrical problems disrupted tracks for all but one line.

It was the first accident since Dec. 17, 1992, when 14 people were injured as a Fremont-bound train jumped the tracks in an underground tunnel about 200 yards outside the 12th Street station.

A transit district report on that accident — the worst in BART's 20-year history — blamed the derailment on wheel and rail wear, acceleration and speed, along with the fact that the train was running south on a track usually reserved for northbound travel.

Sunday, September 12, 1993

BART suspends train operator

■ Officials suspect human error may have caused Friday's derailment

By Joel Maybury
STAFF WRITER

BART officials think Friday afternoon's derailment of an out-of-service train in Oakland may have been caused by a train operator.

"The preliminary investigation is pointing toward human error," BART spokesman Mike Healy said Saturday. Healy said the operator may not have followed BART's procedures properly when moving the train on the spur track to get it into position to go into service.

Although BART hasn't completed its investigation, it has

placed the train operator on administrative leave without pay pending a hearing on the accident. Healy said he would not speculate on whether the employee could be fired.

BART also would not release the name of the train operator. Sources said she is a veteran of at least six years. The district still hasn't seen the results of a mandatory post-accident drug test.

The 10-car train derailed on a storage track north of the 19th Street station. No one was injured, but the train tied up commuter traffic for 2 1/2 hours after it knocked out power. The lead car, with its trademark slant-nosed cab, and the front axle of the second car derailed.

THOUSANDS OF COMMUTERS got stuck Friday evening when an empty BART train derailed and stopped service between the 19th Street and MacArthur stations in Oakland. No one was hurt.

KARL MONDON/Times

BART commute turns ugly as derailed train clogs system for hours

By ROBERT OAKES
Staff writer

OAKLAND — A BART derailment Friday evening created a nightmare commute and stranded thousands of East Bay residents trying to get home.

An empty train that was being taken out of service derailed about 3:30 p.m. on a spur track between the 19th Street and MacArthur stations in Oakland, said BART spokeswoman Vicki Wills.

Transit district officials shut down the adjacent tracks, cutting off all trains at the central convergence of the BART system. Service resumed about 5:45 p.m., but train speed was limited, Wills said.

"We're trying to get things back to normal, but there are just so many people on those trains," Wills said.

The BART delay came on the heels of another Commute from Hell on Thursday, when a jackknifed big rig blocked parts of the Interstate 680-Highway 24 interchange. Monster traffic backups lasted several hours.

BART officials had not determined by late Friday night what caused the derailment. Late last year a train derailed and crashed in a tunnel several miles from the site of Friday's accident.

An operator who was alone on the 10-car train was not injured, Wills said.

The BART delay infuriated many passengers.

Matt McClure of Pinole waited more than 45 minutes at the Orinda station for his wife. The couple had planned a quick weekend getaway.

"It's a real pain," McClure said. "I don't know if I should go home. I

don't know what to do."

Most commuters got stranded at the 12th Street station in downtown Oakland, where Concord- and Richmond-bound trains stopped. BART station agents and police tried to direct passengers to buses that went to the MacArthur station, where some trains were still running.

Long lines of refugee commuters gathered on Oakland streets and waited for AC Transit buses.

Ewe Krauss, a tourist from Germany, was trying to take his family to San Francisco. He wandered around the station agent's booth, where dozens of others waited for information.

"We do things a little better in Germany," Krauss said. "Trains run on time, and it's not this confusing."

BART carries nearly 260,000 passengers daily. In the peak two-hour evening commute period, about 30,000 travel the transbay route.

As service slowed or stopped, crowding became a hazard at some downtown San Francisco stations. At one point, BART trains went through the the Embarcadero and Montgomery Street stations without stopping.

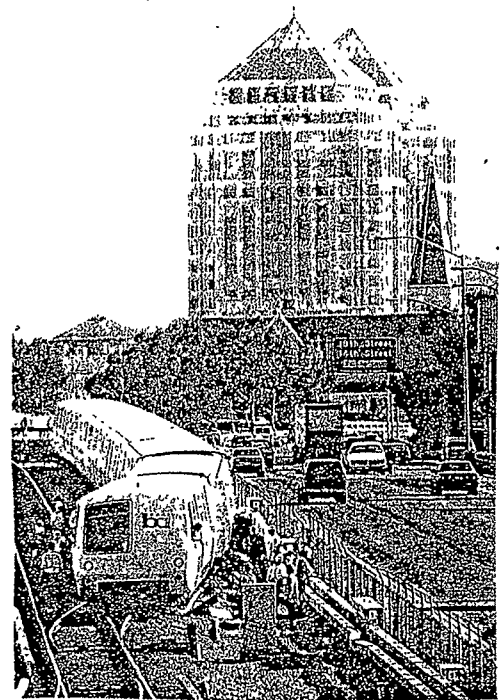
The platforms were so packed that passengers couldn't get off safely, Wills said.

While some commuters were fuming, other riders were resigned to the long delay.

Steve Wang got stranded at the Daly City station, but he hitched a ride with a friend to the Orinda station. Wang waited there for another friend to drive him home to El Sobrante.

"What good is being mad?" Wang said. "It's just inconvenient."

By late evening, commuters at



the Pleasant Hill station reported delays of 45 minutes to two hours.

"Since the beginning of the year, this is about the dozenth time this has happened to me," said Shawna Clawson, a 22-year-old secretary. "There has to be something they can do."

William Wilkins, who runs a video conferencing center in San Francisco, said he wasn't upset.

"I just wish they had more of an emergency plan," Wilkins said. "I think the problem is BART spends too much time expanding and not enough time improving."



RON RIESTERER — Staff

The last two cars of an empty 10-car BART train derailed Friday afternoon near 27th Street in Oakland, sparking two small fires.

Empty BART train derails, causing fire and long delays

FROM STAFF REPORTS

An empty, 10-car BART train bound for the 19th Street station derailed along Interstate 980 in Oakland Friday, sparking a small grass fire and snarling the afternoon train commute, police said.

The train was traveling westbound on a service rail just before 3:30 p.m. when the last two cars derailed, just north of 27th Street.

It took about 25 minutes for firefighters to search the train and extinguish a small fire under the cars and then a grass fire that ignited nearby, said Battalion Chief Ron Carter.

The conductor was the only person on the train at the time of the derailment. He was not injured, police said.

BART spokeswoman Vicki Wills said trains were halted between the MacArthur and 12th Street stations and buses were ferrying passengers between the two locations.

Although trains on all other lines continued to operate, service was severely delayed and weary commuters complained that the transit system's public address system did not initially notify them of the problem.

Wills said many passengers were upset when trains did not stop at the Embarcadero and Montgomery Street stations in San Francisco because the platforms were overloaded with people.

"It was a safety issue," she said.

Wills said that the derailed train was not blocking the tracks.

BART derailment wrecks commute

Cause of Oakland mishap unknown

By Jim Herron Zamora
and Charles Hardy
OF THE EXAMINER STAFF

OAKLAND — For thousands of BART passengers, the normally hectic week-ending commute home grew hellish Friday when an out-of-service train derailed, causing no injuries but slowing service for several hours.

The train derailed at 3:24 p.m. at a storage track between the 19th Street and MacArthur stations, said Vicki Wills, a spokeswoman for Bay Area Rapid Transit. No passengers were on board and the train operator was not hurt, she said.

All service to the MacArthur Station was halted for more than an hour and once it resumed the trains passed by very slowly, Wills said. Service was fully restored in downtown Oakland at 5:45 p.m.

For several hours, passengers on Concord and Richmond trains took buses from the 19th Street Station to the MacArthur Station. To clear the backlog, buses also took riders from the West Oakland Station to the Ashby and Rockridge stations.

"The trains and the platforms are totally packed," Wills said at 7:15 p.m. "We're really backed up."

Although the track serving passengers from San Francisco to Fremont was not blocked, its trains also were slowed by the general confusion. Trains going from the East Bay to San Francisco and Richmond to Fremont were not

affected.

Wills said BART officials did not know what caused the train to jump the tracks.

"It's caused a massive train delay and chaos in the system among the passengers," said Ann Bolden, a 19th Street Station agent who busily redirected riders.

The last derailment in the system's 20-year history occurred on Dec. 17 when a train left the tracks just south of Oakland's 12th Street Station on the Fremont-Richmond line, injuring 14 people and shutting down a stretch of track for three days.

Friday's accident threw many commuters into confusion as they tried to figure out how to get home.

"This sucks," said Kevin Oh, 23, who waited at the Embarcadero Station for a train to take him home to Berkeley. "I'm supposed to meet my friends for dinner and I can't get hold of anyone."

A couple blocks away at the Transbay Terminal, BART passengers scanned the AC Transit schedule to find a bus they could take home.

"I used to do this all the time, but I'm not sure which will get me home quicker," said Ed Chilton, a Chevron planner who lives in El Cerrito. "The bus is fine .. I'd never drive — I'd sooner walk."

The derailment caused chaos in Oakland, as well. In the downtown, the line for the AC Transit bus line on 14th Street, near BART, stretched around the corner of Broadway and about half a block down 14th Street. At times 300 people stood in line, waiting for a bus to take them to another BART station.

"It definitely makes the commute interesting, not the same old thing every day," quipped Ed Larky, a Howard Container Co. employee who was en route to Concord at 5 p.m. when he discovered the delay. "There's no sense in being put out. If you take public transit, certainly things are going to go wrong occasionally. Fortunately, it hasn't happened that much."

But Steve Yeh, a Port of Oakland computer programmer, was less philosophical.

"My wife is waiting for me in Walnut Creek," he said. "We are car-pooling. Hopefully, when I get there, the car is still there."

Standing about midway in the long bus line was a slightly irritated Doret Hunte, who was anxious to get to Concord and pick her child up from the baby sitter.

"It's going to cost me overtime and who's going to pay for that — me?" posed Hunte. "And it's very unorganized. There's no buses."

BART rebukes operator for derailment

By Joel Maybury
STAFF WRITER

BART has issued a "written warning" to the train operator the transit district is blaming for a Sept. 11 derailment that caused massive delays throughout the rapid transit system.

The accident happened on a storage track between the MacArthur and 19th Street stations in Oakland as the afternoon commute was starting. The operator, an unidentified woman with seven years of experience, was moving an empty 10-car train to get it ready for the commute.

"That move has been made many times by many operators and it was done fine," BART spokesman Mike Healy said Friday. "She knew how to make the move. She just made a procedural error."

The derailment occurred when the train accidentally ran over a collision prevention device that kicked the wheels off the track.

The operator was responsible, "there's no question about that," Healy said. He said she has been a good train operator and is being retrained.

Jayne Faria, the president of Local 1555 of the Amalgamated Transit Union, said the union is working on a report about the way BART handled the resulting train delays.

After the derailment, which occurred right at the center of the system, BART closed at least one station because it didn't want too many people on the platforms.