U.S. Department of Transportation
Federal Railroad Administration

2002 RAILROAD EMPLOYEE FATALITIES:

AN ANALYTICAL STUDY

Office of Safety
Washington, DC 20590

February 2005

Memorandum

U.S. Department
of Transportation

Federal Railroad Administration

Date: February 25, 2005

Subject: **2002 Railroad Employee Fatalities: An Analytical Study**

From: Daniel C. Smith
Associate Administrator for Safety

To: Distribution

On behalf of the Office of Safety, I am pleased to distribute this report**,** entitled "2002 Railroad Employee Fatalities: An Analytical Study," which is designed to promote and enhance awareness of many unsafe behaviors and conditions that typically contribute to railroad employee fatalities. By furthering our understanding of the causes of railroad employee fatalities, this report is intended to assist railroad industry stakeholders in their efforts to prevent similar tragedies.

This document contains the following materials:

- Narrative reports which provide in-depth coverage of 2002's 19 railroad employee fatalities, helping readers to visualize the accident scene and chain of events leading up to the fatalities, and the post-accident investigation process;
- Summaries, preceding each narrative report, which highlight important elements of each *individual* fatality, particularly the possible contributing factors (PCFs);
- *Overall* findings for the 2002 fatalities which identify *who* the majority of fatally injured employees were (i.e. craft, job position, age group, and years of service); *what* most were doing at the time of the incidents; *when* most were fatally injured (i.e. time of year and time of day); *where* most incidents occurred (i.e. type of railroad); and most importantly, *why* most fatalities occurred in terms of PCFs; and
- Bar and pie charts which illustrate the above findings.

OVERVIEW OF 2002 RAILROAD EMPLOYEE FATALITIES

EXECUTIVE SUMMARY

This document, entitled "2002 Railroad Employee Fatalities: An Analytical Study," was developed to promote and enhance awareness of many unsafe behaviors and conditions that typically contribute to railroad employee fatalities. By furthering our understanding of the causes of railroad employee fatalities, this report is intended to assist railroad industry stakeholders in their efforts to prevent similar tragedies.

This document contains the following materials:

- Narrative reports which provide in-depth coverage of 2002's 19 railroad employee fatalities, helping readers to visualize the accident scene and chain of events leading up to the fatalities, and the post-accident investigation process;

- ***Summaries, preceding each narrative report, which highlight important elements of each individual fatality, particularly the possible contributing factors (PCFs).*** This format allows the reader to walk through and analyze each fatality scenario, identifying ways the fatalities could have been prevented. PCFs are expressed as brief narrative statements such as "The Switchman Foreman got off moving equipment, in non-compliance with the railroad's operating rules."

  The summaries also list Selected Factors which identify where and when the individual fatalities occurred, particulars about the fatally injured parties (i.e. age, years of service, training, and certification where applicable), craft and positions of the other workers, and major activities of fatally injured employees at the time of the incidents;

- ***Overall findings for the 2002 fatalities (see Pages 2-7)*** which identify ***who*** the ***majority*** of fatally injured employees were (i.e. craft, job position, age group, and years of service); ***what*** most were doing at the time of the incidents; ***when*** most were fatally injured (i.e. time of year and time of day); ***where*** most incidents occurred (i.e. type of railroad); and most importantly, ***why*** most fatalities occurred in terms of ***PCFs***; and

- Bar and pie charts ***(Appendices A through I)*** which illustrate the above findings.

COMPLEXITY OF FATALITIES

Fatalities usually resulted from a chain of events or the errors of more than one individual, as revealed by the PCFs for each fatality. ***In 2002, approximately 84 percent of all fatalities had three or more PCFs. Fatalities ranged in complexity from only one PCF to six PCFs.***

As an example, Report FE-10-02 describes a complex fatal incident in which an Electric Traction Work Crew was removing a sectionalizing switch from a catenary pole when the Lead Maintainer was struck by a passing train, dying two hours later from head trauma. The event involved the following six PCFs:

- In non-compliance with Federal regulations, the employees did not receive a safety briefing, nor did they demonstrate to investigators an understanding of the safety procedures to be used on the night of the incident;

- The Employee-in-Charge (EIC) failed to obtain foul time in the proper manner (by listing track designation, track limits, and time limits requested; repeating the request; and receiving confirmation from the issuing authority before implementing foul time) in non-compliance with Federal regulations;

- The EIC failed to comply with Federal regulations governing radio procedures for ending transmissions;

- Investigators determined that the EIC had not received field training by a supervisor, nor did he demonstrate an understanding of the duties of an EIC;

- The EIC was inexperienced with an important function of an EIC; during his one year in this role, he had obtained foul time only four times; and

- Investigators determined that the railroad's compliance testing program had placed little emphasis on Roadway Worker Protection/On-Track Safety (RWP/OTS).

FINDINGS

WHO were most of the fatally injured employees?

- ***Craft: Transportation and Engine (T&E) Employees***

  In 2002, T&E employees represented approximately 42 percent of railroad employee fatalities, Maintenance of Equipment (MOE) employees approximately 37 percent, Maintenance of Way (MOW) employees approximately 16 percent, and Signal and Train Control (S&TC) employees approximately 5 percent of railroad employee fatalities.

  (See Appendix A, 3-D pie chart entitled "2002 Railroad Employee Fatalities By Craft.")

- ***Position: Carmen***

  In 2002, approximately 32 percent of all fatally injured employees were Carmen, and approximately 16 percent were Conductors. Ranking third, Locomotive Engineers comprised approximately 11 percent of all fatally injured employees. Other fatally injured employees included a Brakeman, High Tension Gang Foreman, Machinist, Overhead Maintainer, Rail Track Grinder Operator, Switchman, System Laborer, and Yard Foreman.

  (See Appendix B, stacked bar chart entitled "2002 Railroad Employee Fatalities by Craft and Position.")

- ***Experience: Very Experienced (21-35 Years of Service)***

  Most fatally injured employees in 2002 were very experienced; approximately 47 percent had served 21-35 years. The very inexperienced, who served 0-5 years, and employees with 21-35 years of experience each ranked second at approximately 21 percent of all fatally injured employees.

  (See Appendix C, stacked bar chart entitled "2002 Railroad Employee Fatalities: Years of Service by Craft.")

- ***Age Range: 46-55 Years***

  In 2002, approximately 47 percent of all fatally injured employees were concentrated in the 46-55 year range. Employees in the 36-45 year range represented approximately 37 percent of all fatally injured employees. The remaining approximately 16 percent of fatally injured employees were in the 18-35 year range.

  (See Appendix C, cluster bar chart entitled "2002 Railroad Employee Fatalities: Age Ranges by Craft.")

WHAT were most of the fatally injured employees doing when they were fatally injured?

- ***Activity: Switching or Repairing Freight Cars and Locomotives***

  In 2002, approximately 26 percent of fatally injured employees were involved in switching, and approximately 21 percent were fatally injured while repairing freight cars and locomotives. Ranking third, employees en route via train comprised 11 percent of all fatally injured employees. Other activities in which employees were fatally injured in 2002 included boarding a standing locomotive, car inspection, traveling en route via highway vehicle, removal of a sectionalizing switch from a catenary pole, repair of a downed power line, repair of a loading ramp, and track maintenance.

(See Appendix D, stacked bar chart entitled "2002 Railroad Employee Fatalities by Craft and Activity.")

WHERE did most of the railroad employee fatalities occur?

- ***Type of Railroad: Class I Freight Railroads***

  In 2002, approximately 68 percent of all railroad employee fatalities occurred on Class I freight railroads, approximately 16 percent on Class II and III railroads, and approximately 16 percent on commuter/passenger railroads. These railroad categories employed approximately 78 percent, approximately 11 percent, and approximately 11 percent of the nation's total railroad employees, respectively.

  (See Appendix E, 3-D bar [cylinder] chart entitled "2002 Railroad Employee Fatalities by Type of Railroad.")

WHEN did most of the fatalities occur?

- ***Season(s): Spring or Summer***

  In 2002, approximately 42 percent of all fatalities occurred in the spring and approximately 26 percent in the summer. In the winter and fall seasons, respectively, approximately 21 percent and 11 percent of railroad employee fatalities occurred.

  (See Appendix F, pie chart entitled "2002 Railroad Employee Fatalities by Season of Year.")

- ***Time of Day: Day by a Small Margin***

  Data of the U.S. Naval Observatory, Astronomical Applications Department, provided the precise times for sunrise and sunset for the specific dates and locations of the fatalities. To distinguish fatalities which occurred during daylight from those which occurred during darkness, this analysis employs the definitions of "day" as at sunrise through sunset, and "night" as immediately after sunset until sunrise. In 2002, approximately 53 percent of the fatalities occurred during the day and approximately 47 percent during the night.

  (See Appendix F, pie chart entitled "2002 Railroad Employee Fatalities by Time of Day.")

WHY did most of the fatalities occur?

- ***Major four PCF Categories in descending order:***

  Train Operation and Human Factors
  Miscellaneous Contributing Factors
  Mechanical and Electrical Failures AND Track and Signal Failures

- ***Most PCFs: Train Operation & Human Factors***[1]

  - In 2002, approximately 58 percent of all PCFs to the 19 fatalities were Train Operation & Human Factors, followed by approximately 38 percent which were Miscellaneous Contributing Factors.[2]

  - In 2002, approximately 3.5 percent of the PCFs involved Mechanical and Electrical Failures (specifically a high/low coupler mismatch and defective wheel true machine) and approximately another 3.5 percent involved Track and Signal Failures (specifically a partially uninsulated downed power line and a missing roadbed).

(See Appendix G, 3-D pie chart entitled "2002 Railroad Employee Fatalities: Major Possible Contributing Factor Categories.")

Break-down of Train Operation & Human Factors

- ***Of all the Train Operation & Human Factors in 2002, two sub-categories predominated: Miscellaneous Human Factors, Track, at approximately 31 percent, and Miscellaneous Human Factors, Motive Power and Equipment (MP&E) at approximately 21 percent.***

  Miscellaneous Human Factors, Track included fouling track or positioning oneself in front of or between rail equipment; failure to obtain foul time in the proper manner; failure to correct milepost limits on forms before starting job; failure to halt train operations for emergency repairs; and failure to maintain track-related structures (culverts).

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1 **During 2002, Train Operation & Human Factors included improper use of brakes; employee's physical condition; inappropriate or nonexistent flag and radio signals; human factors, Track; human factors, MP&E; improper speed; errors in the use of switches; and non-compliance with general switching rules.**

2 **Miscellaneous Contributing Factors, in 2002, included poorly prepared employees; environmental conditions; inexperience; highway collisions; and systemic problems, such as inadequate compliance testing.**

Miscellaneous Human Factors, MP&E included boarding or exiting a train too close to the adjacent track; improperly blocking rail cars prior to repair; failure to assure proper clearance for movement; and creating and/or failing to correct dangerous work conditions. As an example of creating dangerous work conditions, one of two Carmen was fatally injured by an explosion while trying to repair a freight car's defective cylinder, which one of the Carmen had previously cleaned with a highly flammable substance.

- ***At 12 percent of Train Operation and Human Factors, Flagging and Radio Signals was the next prevalent sub-category.*** This sub-category comprised absence of a blue signal, improper radio communication, and no portable radios provided as required by the job.

- ***Three sub-categories tied at 9 percent each: Improper Use of Brakes (e.g. failure to secure handbrakes); Improper Use of Switches (e.g. improperly lined; radio-controlled switch not locked properly); and Non-compliance with General Switching Rules (e.g. failure to couple).***

- ***The remaining sub-categories, Employee's Physical Condition (e.g. fatigue or impairment due to drugs or alcohol); and Improper Use of Speed represented 6 percent and 3 percent of Train Operation and Human Factors, respectively.***

(See Appendix H, cluster bar chart entitled "2002 Railroad Employee Fatalities: Train Operation & Human Factors Involved.")

Break-down of Miscellaneous Contributing Factors

- ***Two sub-categories predominated: Poorly Prepared Employees at approximately 42 percent and Environmental Conditions at approximately 33 percent of all Miscellaneous Contributing Factors.***

  Poorly Prepared Employees included inadequate briefings; failure to provide instructional materials such as manuals, manufacturer's operational instructions, technical bulletins, etc.; inadequate training provided; lack of communication among employees; employees distracted at critical moments; and poor decision-making.

  Environmental Conditions included poor visibility because of inadequate artificial light at night; electrical hazard from downed transmission lines; extreme temperature fluctuations negatively affecting track conditions; moving equipment not heard by employees; and visibility obscured by train movements on adjacent tracks.

- ***The remaining three sub-categories, Inexperience, Highway Collisions (including seatbelt not worn), and Systemic Problems (specifically inadequate compliance testing of RWP/OTS) comprised approximately 13 percent, approximately 8 percent, and approximately 4 percent of all Miscellaneous Contributing Factors.***

(See Appendix I, cluster bar chart entitled "2002 Railroad Employee Fatalities: Miscellaneous Contributing Factors.")

INDIVIDUAL SUMMARIES AND REPORTS

(FE-01-02 THROUGH FE-29-02)

SUMMARY FOR FE-01-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: CSX Transportation, Incorporated
Location: Palmetto, Florida
Region: 3

Month: January
Date: Jan. 8, 2002
Time: 1:45 p.m., EST

Data for Fatally Injured Employee(s)

Carman
33 years old
Six years, seven months of service
Last rules training: Jan. 4, 2001
Last safety training: Jan. 4, 2001
Last physical: August 1999

Data for All Employees (Craft, Positions, Activity)

Craft: Maintenance of Equipment

Positions:

Bradenton
Fatally injured Carman
Two Assistant Carmen

Tampa light repair track
Sheet-metal Worker

Port Manatee
Yardmaster
Engineer/Switchman

Driver of the tractor-trailer

SUMMARY FOR FE-01-02 CONTINUED
SELECTED FACTORS CONTINUED

Activities:

The fatally injured Carman made an inbound inspection of two tracks at the Bradenton terminal prior to transporting the out-of-date, Time-O-Test device to the Tampa repair shop in exchange for a calibrated device. He was en route to Tampa in his own vehicle when he stopped at Port Manatee and made repairs to three cars at the exchange tracks. ***He was back en route to Tampa in his own personal vehicle at the time of the accident.***

EVENT

En route from one job site to another (Bradenton, Florida terminal to the Tampa, Florida repair shop), the Carman was ejected and fatally injured when his personal vehicle, a Dodge truck, was struck by a tractor-trailer.

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

The Carman failed to yield the right-of-way to the driver of the tractor-trailer while making a left-hand turn.

PCF No. 2

At the time of the accident, the fatally injured Carman was not wearing his seatbelt.

REPORT: **FE-01-2002**

RAILROAD: CSX Transportation, Incorporated (CSX)

LOCATION: Palmetto, Florida

DATE & TIME: Jan. 8, 2002; 1:45 p.m., EST

EVENT[1]: Traffic Accident

EMPLOYEE:

Craft:	Maintenance of Equipment (MOE)
Occupation:	Carman
Age:	33
Length of Service:	Six years, seven months
Last Rules Training:	Jan. 4, 2001
Last Safety Training:	Jan. 4, 2001
Last Physical:	August 1999

CIRCUMSTANCES PRIOR TO ACCIDENT

The Tropicana Orange Juice plant was located in Bradenton, Florida, 38.7 miles south of the CSX Transportation Yeoman/Uceta Yard and mechanical facilities at Tampa, Florida. CSX operated a unit train, No. 0823, also known as the "Tropicana Juice Train," that transported orange juice products from the Florida Tropicana plant to New Jersey each day. In order to expedite the unit train inspection and brake testing, CSX established a Carman's position at the Tropicana Bradenton plant for the 7 a.m. to 3 p.m. shift. CSX supported the position by providing office space, forms, tools, and a light mobile repair truck at the Bradenton outlying point. The employee reported to mechanical supervisors at the Tampa Light Repair Car Shop offices.

A reduction of mechanical forces at the Tampa CSX Project Freight Car Repair Shop resulted in the fatally injured Carman exercising his seniority and reporting for the Bradenton Carman

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[1] "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

position on Jan. 4, 2002. He had been working a "700"[2] position as the Tampa Light Repair Shop Supervisor prior to being displaced.

On the morning of the accident, two other displaced Carmen were sent from the Tampa Repair Shop via light repair truck to receive training on the Bradenton operations. At Bradenton, work records show the three Carmen performed an inspection and initial terminal freight train air brake test on outbound unit train No. 082308 from 7:30 a.m. to 10:10 a.m. They also performed an application and release test of the train air brakes from 10:20 a.m. to 10:30 a.m. after the outbound train crew made the train complete. The transportation records listed unit train No. 082308 as departing Bradenton with 50 cars at 9:55 a.m. on Jan. 8, 2002. The two visiting Carmen returned to Tampa after the unit train departed Bradenton, and the remaining Carman made an inbound inspection of Tropicana Tracks Nos. 3 and 4 from 10:50 a.m. to 12:30 p.m.

Prior to the two Carmen returning to Tampa, the Bradenton Carman had commented to them that he was going to check some cuts and get some foreign repairs. A Sheetmetal Worker, working at the Tampa light repair track, had contacted him that morning and informed him that he needed to exchange the out-of-date, Time-O-Test device[3] for a calibrated device. The Bradenton Carman had told the Sheetmetal Worker that he would bring the device to him that afternoon at the Tampa light repair track. He was scheduled to work his previous "700" Tampa Shop Supervisor's assignment the next day, which was his rest day.

Piney Point Road was located along US Route 41/State Road 45, 11.2 miles north of the Tropicana plant in Bradenton and 6.7 miles north of Palmetto, Florida. It was also along the normal route taken between the Bradenton Tropicana plant and the CSX Tampa Light Repair Track, a distance of 38.7 miles. The road was one of two entrances/exits from US 41/SR45 into the Manatee County Port Authority, Port Manatee terminal railroad (MAUP), where CSX and MAUP interchanged freight cars.

The Port Manatee Yardmaster and Engineer/Switchman provided information that the Bradenton Carman had been at the interchange tracks and had made repairs to three cars the day of the accident. After completing the repairs, he had approached the MAUP's Engineer/Switchman regarding additional repairs on cars located on the hold track. The Engineer/Switchman informed the deceased that the two additional cars on the track were being held for door/outlet repairs. The Bradenton Carman determined that the repairs were too heavy for him to undertake and advised the Engineer/Switchman that CSX would come back and repair them another day. The Engineer/Switchman watched the Carman back his truck out and head eastward to leave the facility. The Engineer/Switchman remembered that the conversation took place just prior to him hearing the emergency personnel responding, approximately five minutes after speaking with the deceased. The time was about 1:40 p.m.

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2 "700" position is the term used to describe the agreement wherein contract personal are selected to fill temporary vacancies of approved non-contract personnel (supervisory position).

3 A "Time-O-Test" device is used with a ground air line to apply, release, and leak check train air brakes during train air brake testing operations.

US Route 41/State Road 45 was a 4-lane road, two southbound and two northbound lanes divided by a grass median. The posted speed limit was 65 mph. The Piney Point Road intersection extended westward with a STOP sign for eastbound traffic approaching the US 41/SR 45 intersection. A turn lane was located on the west side of the southbound lanes of US 41/SR 45 for southbound traffic turning onto Piney Point Road.

The weather was sunny and clear at the time of the accident.

THE ACCIDENT

Intersection of Piney Point Road and US Route 41/State Road 45

The Florida Highway Patrol's Traffic Crash Report states that the Carman was traveling eastbound on Piney Point Road, attempting to make a left turn onto northbound State Road 45. A Tractor/Trailer hauling a concrete manhole drain was traveling southbound in the left lane of SR 45. According to a witness, an unidentified vehicle made a right turn from southbound SR 45 onto westbound Piney Point Road. The Carman entered onto southbound State Road 45 at the same time, failed to observe the southbound tractor/trailer in the southbound left-hand lane, and drove into the direct path of the tractor/trailer. The driver of the tractor/trailer took evasive action; however, his vehicle struck the Carman's left front door. The Carman's truck bed and tail gate were torn from his vehicle and landed on the west grass shoulder. The Carman's truck was pushed in a southeast clockwise direction, his passenger side door swung open, and he was ejected from his truck. He struck the pavement and rolled to the northbound left lane of SR 45. His truck slid in a southeast direction, stopping across the dividing lines of northbound SR 45. The tractor/trailer veered in a southwest direction into the center grass median. The concrete manhole cover was ejected from the flatbed trailer and came to rest in the southbound left lane of SR 45. The tractor/trailer left 206 feet of post-collision skidmarks on the roadway.

The Manatee County EMS responded to the scene of the accident and transported the deceased to Manatee Memorial Hospital where he was pronounced dead at 1:55 p.m.

POST-ACCIDENT INVESTIGATION

The Florida Highway Patrol contacted the Carman's family and informed them of the accident. The family contacted the second shift CSX Tampa Yardmaster who then contacted the Tampa General Car Foreman who began to verify the accident and obtain information. Confusion and trouble in receiving verification delayed CSX's response and investigation.

At the scene of the accident, the Carman was found to have been driving his personal vehicle, a 1998 Dodge Truck. The Carman's work forms and associated paper work from his activities at Bradenton and Port Manatee were found along the west grass shoulder of SR 45. In addition, tools, a blue flag, freight car brake shoes, and a Time-O-Tester device were found at the scene.

As the deceased was driving his personal vehicle at the time of the accident, CSX had concerns as to whether he would be considered to have been in on-duty status. However, materials found at the scene and conversations with the Port Manatee employees convinced CSX officials that he

had been on duty. It is believed that instead of driving the CSX Bradenton repair truck to Port Manatee, performing the repairs, and returning to Bradenton to retrieve his personal vehicle, the Carman elected to use his own vehicle and continue northward to Tampa after performing the work at Port Manatee. At the time of the accident, the Carman was not wearing his seat belt.

The Florida Highway Patrol had assigned Traffic Homicide Investigation Case Number FHP 702-15-01 to this accident and would be conducting an investigation. The FHP Officer's investigation would include toxicological testing to determine if the Carman was driving while impaired. However, there was no indication of impairment at the time of this writing.

APPLICABLE RULES

Florida State Motor Vehicle Statute 316.614 - Safety belt usage.
Florida State Motor Vehicle Statute 316.123(2)(a) - Vehicle entering stop or yield intersection.

SUMMARY FOR FE-03-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Georgia Southwestern Railroad
Location: Shellman, Georgia
Region: 3

Month: January
Date: Jan. 17, 2002
Time: 2:30 a.m., EST

Data for Fatally Injured Employee(s)

Locomotive Engineer (functioning as Operations Manager)
37 years old
10 years of service
Last rules training: Nov. 15, 2001
Last safety training: Nov. 15, 2001
Last physical: Unknown

Data for All Employees (Craft, Position, Activity)

Craft: Transportation and Engine

Positions:

Train No. 3837
Locomotive Engineer (functioning as Operations Manager)
Conductor (functioning as Student Engineer)

Carrier employee with hi-rail vehicle

General Manager
Road Master

Other Affected Parties

Farm Worker
Landowner East
Landowner West
National Resources Conservation Service:
District Conservationist & Randolph County Technician

SUMMARY FOR FE-03-02 CONTINUED
SELECTED FACTORS CONTINUED

Activities:

The Train Crew proceeded from Smithville to Cuthbert, stopping en route at Dawson, Georgia to set out three cars, pick up 15 cars, and perform an intermediate air brake test. En route to Cuthbert from Dawson, the Student Engineer became aware of the missing roadbed about 40 feet in advance, but did not have time to apply the emergency brake.

EVENT

The Locomotive Engineer/Operations Manager was crushed by railroad cars during a derailment.

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

En route from Dawson to Cuthbert, Georgia, the Student Engineer became aware of the missing roadbed about 40 feet in advance, but did not have time to apply the emergency brake to prevent the resulting derailment.

PCF No. 2

The time of day (night) made it difficult for the Student Engineer to see the missing roadbed.

PCF No. 3

The railroad did not comply with Federal regulations requiring that it maintain, and keep free of obstruction, drainage or other water-carrying facilities under or immediately adjacent to the roadbed, to accommodate expected water flow for the area concerned. The carrier's records covering the 378 days preceding the derailment showed only one correction of a blocked culvert. Review of the procedures and policies for drainage facility inspections revealed that the railroad lacked an annual culvert inspection program.

PCF No. 4

In response to a complaint from an area landowner, the railroad's Road Master conducted an inspection a little over a week prior to the derailment. He did not report any problems; consequently, the railroad failed to comply with regulations requiring track operations to be halted and remedial action initiated immediately.

OTHER ISSUES

In non-compliance with Federal regulations, the railroad failed to perform toxicological tests on either of the train service employees, claiming the exception allowed when an incident is wholly attributable to a natural cause (washout). FRA's investigation revealed that the cause actually was a choked culvert which overflowed. The culvert had not been maintained properly; nor was it repaired when problems were reported to the railroad several weeks prior to the incident.

REPORT: **FE-03-2002**

RAILROAD: Georgia Southwestern Railroad (GSWR)

LOCATION: Shellman, Georgia

DATE & TIME: Jan. 17, 2002; 2:30 a.m., EST

EVENT[1]: A Locomotive Engineer was crushed by railroad cars during a derailment.

EMPLOYEE:

Craft:	Transportation and Engine (T&E)
Activity:	Operating train
Occupation:	Locomotive Engineer
Age:	37 years old
Length of Service	10 years of service
Last Rules Training:	Nov. 15, 2001
Last Safety Training:	Nov. 15, 2001
Last Physical:	Unknown

CIRCUMSTANCES PRIOR TO THE ACCIDENT

GSWR Train No. 3837 (T-Hauler) went on duty at Smithville, Georgia at 1 a.m., EST on Jan. 17, 2002. Train No. 3837 was a mixed freight train scheduled to travel to Colquitt, Georgia, with cars to be added and removed at two locations en route. The crew comprised an Engineer and a Conductor. The Engineer was also the GSWR Operations Manager. The Conductor was also serving as a Student Engineer. The crew received the required rest period prior to reporting.

The Engineer had signed the Smithville Subdivision Block Register Book at midnight on Jan. 16, 2002 for Train No. 3837 (T-Hauler). The crew performed an initial air brake test with the Conductor/Student Engineer operating the controls. Train No. 3837 (T-Hauler) left Smithville westward toward Cuthbert, Georgia, then was to proceed southward toward Colquitt, Georgia. The train comprised two locomotives and eight cars. Locomotive 3837 was in the lead with the short hood forward. Locomotive 4028 was trailing with the long end forward. The Conductor/Student Engineer was operating the train.

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[1] "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

The Train Crew stopped at Dawson, Georgia, set out three cars, and picked up 15 cars. A proper intermediate air brake test was performed before departing. The Conductor/Student Engineer continued to operate the train, as the Engineer was on the ground operating switches. Train No. 3837 (T-Hauler) left Dawson and continued westward toward Cuthbert with the Conductor/Student Engineer at the controls. The train comprised two locomotives with 18 empties and 2 loads on the rear.

The sky was dark and clear, and the temperature was 38° F.

THE ACCIDENT

Westbound Train No. 3837 (T-Hauler), operated by the Conductor/Student Engineer, was traveling at approximately 22 mph as it approached the accident site at about 2:30 a.m. The Student Engineer was sitting at the locomotive controls on the north side of the lead locomotive cab, and the Operations Manager was sitting in the passenger seat on the south side of the same cab. As the train approached MP 303.3, the Student Engineer became aware of the missing roadbed about 40 feet in advance and did not have time to apply the emergency brake.

The front of the lead locomotive fell into the washed out area (50 feet long and 20 feet wide), with the rear rotating to the north. The locomotive came to rest approximately perpendicular to the track. The front end of the trailing locomotive went to the north, with the rear then coming in on top of the lead locomotive. The first three cars behind the locomotives also derailed. The cars remained upright and parallel with the track.

The Student Engineer was thrown out of the cab window on impact. He sustained facial lacerations and a fractured ankle. After the accident, he found himself about three car lengths west of the derailment, on the roadbed. He went back to the locomotive and found that the Operations Manager was dead. He then walked 4.5 miles to the GSWR's station in Cuthbert, Georgia. The Student Engineer was unable to reach 911, but contacted the Cuthbert Fire Department. He then contacted the carrier's General Manager and another employee. The employee, who had a hi-rail vehicle, took the Student Engineer and two Firemen/EMS to the accident site. Toxicological tests were not performed on either of the train service employees.

POST-ACCIDENT INVESTIGATION

A subsidiary of Rail America, Incorporated, GSWR operated three subdivisions in southwestern Georgia and southeast Alabama. The Smithville Subdivision is a single main track running generally east to west from Smithville, Georgia, Milepost 276.0, to Eufaula, Alabama, Milepost 334.2. The Smithville Subdivision was controlled by a block register located at Smithville. The maximum authorized track speed through the accident area was 25 mph as designated in GSWR Timetable No. 6.

An investigation of the accident site revealed that a 50-foot long, 20-foot wide hole had developed in the roadbed at milepost 303.3. The hole extended from the north toe line of the embankment to about the edge of the ballast line on the south side of the track. The southern side of the embankment was still intact and had not been breached by the water. The embankment at the accident site is approximately 25 foot high and extends about 700 feet between cuts. The failed embankment's

fill material was obvious on the south side of the railroad extending from the outlet of a concrete box culvert.

A 6-foot concrete box culvert extending through the railroad embankment was located about 50 feet east of the failed embankment. The culvert was constructed around 1911 with concrete cast in place. The culvert flow line was about 25 feet below the rail. An inspection of the culvert after the accident revealed that it was in good condition and clear of any debris.

A small stream flowed through the culvert from north to south. The stream was the approximate property line between two adjacent property owners north of the railroad. A farm pond owned by Landowner East was located about 1,700 feet north of the railroad. A survey of the area north of the track revealed that high water had been standing for a considerable period of time due to marking on the trees. The Student Engineer stated that he had been over this area twice a day, two or three times a week, for the past five months. He stated that the water was always there. On Nov. 19, 2001, a farm worker discovered the water backed up on the property of Landowner East, north of the railroad, and notified the landowner. At a later date, the farm worker and others launched a boat in the backed up water, which extended to the base of the farm pond dam. They floated from the dam all the way to the railroad embankment on the backed up water. They stated that the water was clearly visible from the track. Later while duck hunting on the backed up water, they dropped a shot gun into the water. After recovering the shot gun, the farm workers estimated that the water was 20 feet deep at this point.

Landowner West found out about the high water from his nephew who was out deer hunting. He went to the area during the last part of November or beginning of December. He saw that the water was over his private road and was backed up into his planted pines. He attempted to call the railroad, but was never able to reach anyone.

On Dec. 31, 2003, Landowner East observed the backed up water personally. Concerned, he was able to contact the GSWR General Manager on Jan. 07, 2002. Landowner East advised the General Manager of the water problem and offered to meet with the railroad representative. The General Manager told him that the track had been inspected. The GSWR Road Master inspected the area at the request of the General Manager on Jan. 07, 2002, and did not report any problems.

Landowner East never heard from GSWR again. On Jan. 09, 2002, Landowner East encountered two employees from the Natural Resources Conservation Service, the District Conservationist, and a Randolph County Technician. He asked them to come with him to look at the water problem. They estimated that the water level against the north side of the embankment was about 15 feet below the top of the track and noted that the water was backing up into Landowner West's planted pines. They stated that the north end of the concrete culvert was covered by water, and that there was no water coming out of the south end of the culvert. Using topographical maps, the District Conservationist estimated that the water covered approximately 15 acres.

Track inspections were conducted over the accident site on Jan. 9th and 16th, 2002. The inspection reports did not show any exceptions to the Track Safety Standards at the accident location.

However, the culvert was seen to be discharging about five feet of water from the outlet end on Jan. 16, 2002.

During FRA's ground survey on Jan. 18, 2002, Investigators noted water marks on the trees northwest of the culvert, indicating the water had been backed up for an appreciable period of time. The marks were nine feet above the base of the tree. FRA Inspectors went to the farm pond north of the railroad and found its dam to be in good condition. From that point, FRA Inspectors could see where the water had backed up to the south base of the dam. Continuing south and east from the dam, FRA Inspectors could see the water line in the trees. The watermark was measured to be about 18 feet above the flow line of the culvert. At one point, FRA Inspectors saw a tree that a beaver had chewed in half eight feet, nine inches above the ground.

The carrier produced 51 track inspection records covering the period from Jan. 4, 2001 to Jan. 16, 2002. Several of the required records were missing. An FRA Track Safety Inspector performed hi-rail track inspections over the Smithville Subdivision within a few days after the accident. He recorded 61 exceptions to the FRA Track Safety Standards, nine of which regarded obstructed drainage facilities. The carrier's records covering the 378 days preceding the accident showed only one correction of a blocked culvert. The carrier's records reflected an average of 5.89 defects detected during each of their inspections.

A review of the procedures and policies for drainage facility inspections showed that GSWR did not have an annual culvert inspection program.

APPLICABLE RULES

49 CFR Part 213.33 states:

> Each drainage or other water-carrying facility under or immediately adjacent to the roadbed shall be maintained and kept free of obstruction, to accommodate expected water flow for the area concerned.

49 CFR Part 213.5(a) states:

> Except as provided in paragraph (b) of this section, any owner of track to which this part applies who knows or has notice that the track does not comply with the requirements of this part, shall -
> (1) Bring the track into compliance;
> (2) Halt operations over the track ; or
> (3) Operate under authority of a person designated under 213.7 (a), who has at least one year of supervisory experience in railroad track maintenance, subject to conditions set forth in this part.

49 CFR Part 213.233 (d) states:

> If the person making the inspection finds a deviation from the requirements of this part, the inspector shall immediately initiate remedial action.

49 CFR Part 213.241 (b) states:

> .....Records shall specify the track inspected, date of inspection, location and nature of any deviation from the requirements of this part, and the remedial action taken by the person making the inspection.....

SUMMARY FOR FE-06-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Metro-North Commuter Railroad Company
Location: New Haven, Connecticut
Region: 1

Month: March
Date: March 5, 2002
Time: 6:30 p.m., EST

Data for Fatally Injured Employee(s)

Machinist
36 years old
10 months of service
Last safety training: May 9, 2001
Last physical: April 16, 2001

Data for All Employees (Craft, Position, Activity)

Craft: Maintenance of Equipment

Positions:

Fatally injured Machinist
Co-worker Machinist
Shop Foreman

Activity: Repositioning locomotives on the wheel true machine

EVENT

The Machinist was seriously injured when he was pinned between the wheel true machine's axle centers and the locomotive's third rail shoe while positioning the No. 3 wheels of a locomotive on the machine; he died an hour later at the hospital from his injuries.

SUMMARY FOR FE-06-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

The fatally injured Machinist only had five months experience in the wheel true shop and had not been paired with his co-worker often enough to create familiarity with one another's work habits.

PCF No. 2

The railroad had not made available to employees standard written procedures regarding repositioning equipment in the building. In addition, the fatally injured employee did not receive formal training.

PCF No. 3

Investigators found that the plywood windscreens on the ends of the pit area prohibited employees from observing each other during the moves, inconsistent with railroad operating rules.

PCF No. 4

The location of the idler roller control valve required employees to foul equipment to operate the valve. Investigators believed that the fatally injured employee activated the valve while the equipment still was rolling and just prior to being pinned.

PCF No. 5

The fatally injured Machinist's co-worker was in overtime status when the job had begun; he therefore could have been too fatigued to alertly watch out for the Machinist's safety.

REPORT: **FE-06-2002**

RAILROAD: Metro-North Commuter Railroad Company (MNCW)

LOCATION: New Haven, Connecticut

DATE & TIME: March 5, 2002; 6:30 p.m., EST

EVENT[1]: A Machinist was seriously injured when he was pinned between the wheel true machine's axle centers and the locomotive's third rail shoe while positioning the No. 3 wheels of a locomotive on the machine; he died an hour later at the hospital from his injuries.

EMPLOYEE:

Craft:	Maintenance of Equipment (MOE)
Activity:	Repositioning Locomotives on Wheel True Machine
Occupation:	Machinist
Age:	36 Years
Length of Service:	10 months
Last Safety Training:	May 9, 2001
Last Physical:	April 16, 2001

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On March 5, 2002, at 3:55 p.m., the MNCR Machinist reported for his regularly assigned shift (4 p.m. to midnight) at the railroad's equipment maintenance facility in New Haven, Connecticut. His assignment was to work with a co-worker (another Machinist) on the wheel true machine housed in Building No. 2 (a.k.a. "wheel mill"). The co-worker was working overtime after having completed his regular 8 a.m. to 4 p.m. shift. The two Machinists were assigned to re-profile (a.k.a. "true") the No. 1 wheels on MU Locomotive No. 8820 and the No. 2 and No. 3 wheels of MU Locomotive No. 8821. Building No. 2, located west of the railroad's main maintenance shop, was a permanent metal building with a single track running east/west through it. The wheel true machine was housed in a concrete pit area located in the center of the building. The pit had plywood windscreens at the east and west ends and translucent lexan windscreens on the north and south sides.

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[1] "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

The routine procedure for Machinists assigned to the wheel true machine was to reposition locomotives onto, and off of, the wheel true machine as needed. The workers used two devices to reposition the equipment on the wheel true machine: 1) a capstan and rope, and 2) a winch and cable. The capstan was a rotating cylindrical device which was operated electrically and moved by connecting a rope with a hook attached to one end of the equipment and wrapping the rope around the rotating capstan, thereby moving the equipment into proper position on the wheel true machine. The electrically operated winch could be utilized similarly. When either device was used, visual and audible warning devices were activated to warn workers of the movement. These warning devices were located both inside and outside of the building.

At the time of the accident, the two Machinists had completed their work on Locomotive No. 8820, and were in the process of repositioning the No. 3 wheels of Locomotive No. 8821 onto the truing machine. The weather at the time of the accident was cold and clear. The outside temperature was 28° F.

THE ACCIDENT

Prior to the accident, the fatally injured Machinist was participating in the movement of the equipment, and as was the customary practice, was to place a wooden chock on the rail to stop the equipment when the No. 3 wheel was properly positioned on the machine. He was positioned on the north side of the equipment in the wheel true pit near the control panel. The other Machinist was positioned at the electrically driven capstan approximately 55 feet from the control panel area. From this position, he was unable to see the Machinist at the control panel due to the plywood wind screen.

As the equipment began to roll, the Machinist operating the capstan shouted “free roll” to warn the Machinist in the pit. He released the tension on the rope and dropped it. As the locomotive moved onto the machine’s idler rollers, the Machinist heard the idler rollers sliding into place as the equipment stopped moving. At this time, he heard moaning sounds from his co-worker in the pit. He looked between the side of the locomotive and plywood windscreen and observed the injured Machinist who was pinned between the wheel true machine’s axle centers and the locomotive’s third rail shoe. The Machinist immediately telephoned the Shop Foreman and told him to call “911." He then attempted to move the locomotives to free the pinned Machinist. When the equipment moved off the injured Machinist, he fell to the floor. He was alert and responsive, but complained of breathing difficulty.

The first person to arrive on the scene, an MNCW employee trained in emergency response, administered first aid. EMS personnel from American Medical Response and personnel from the New Haven Fire Department responded. The injured employee was transported by ambulance to Yale New Haven Hospital where he succumbed to his injuries at 7:25 p.m.

POST-ACCIDENT INVESTIGATION

FRA's investigation included the following: an inspection of the equipment and work area; interviews with co-workers and supervisors; and a review of employee qualifications, training, and method of operation. The track inside the wheel true building was inspected by FRA. The track met or exceeded the requirements of Federal Track Safety Standards for "Class 1" track, 49 CFR Subpart C, Track Geometry, Section 213.63. The north rail had a 1-inch profile (depression) about 19 feet west of the wheel milling machine, and a 1 3/4-inch profile (rise) in the north rail at the center of the wheel milling machine.

FRA investigators concluded that the movement had been conducted in compliance with Federal regulations concerning blue signal requirements (49 CFR, Part 218.29). They also concluded, however, that the fatally injured railroad employee had failed to remain clear of moving equipment and had placed himself in an unsafe position during the movement of equipment.

The fatally injured employee, who had just five months experience working in the wheel true shop, had received no formal training other than "on-the-job" training provided by co-workers. FRA found no written standard procedures available to employees regarding proper procedures to be followed in repositioning equipment in the building. The employee and his co-worker had not worked together often and were unfamiliar with one another's work habits.

Investigators found that the plywood windscreens on the ends of the pit area prohibited employees from observing each other during the moves, inconsistent with MNCW Safety Rule No. 9176. The location of the "idler roller control valve" required employees to foul equipment in order to operate the valve. Indications are that the fatally injured employee activated the valve while the equipment was still rolling and just prior to being pinned.

The railroad took the following remedial actions:

- Removal of the east and west end plywood windscreens;
- Removal of the capstan and winch from service;
- Placement in service of a shuttle wagon (remote control car mover);
- Implementation of a formal wheel true training program in May 2002;
- Development of a formal training program for movement of equipment; and
- Redesign (including relocation) of the wheel true's idler roller control valve, to allow employees to operate the wheel true without fouling the equipment.

Toxicology testing was conducted by the Chief Medical Examiner's office of the State of Connecticut. All test results were negative.

APPLICABLE RULES

49 CFR, Part 218, Subpart B §218.29

> §218.29(b)(4) If operated by an authorized employee under the direction of the person in charge of the workmen, a car mover may be used to reposition rolling equipment within this area after workers have been notified of the movement."

MNCW Safety Rule, No. 9176

> Before coupling or operating or moving locomotive, self propelled equipment, machinery, hoisting equipment, transfer table, turntable, vehicle, or other power-operated equipment, machinery, or tool, warn fellow employees and see that they are in safe position.

MNCW Safety Rule No. 9191

> Operate valve or make adjustment or repairs on the outside of equipment only when the equipment is stopped.

SUMMARY FOR FE-07-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Norfolk Southern Corporation
Location: Frankfort, Indiana
Region: 4

Month: March
Date: March 6, 2002
Time: 1:40 p.m., EST

Data for Fatally Injured Employee(s)

Carman
47 years old
23 years of service
Last rules training: N/A
Last safety training: March 6, 2002
Last physical: Within last six months

Data for All Employees (Craft, Position, Activity)

Craft: Maintenance of Equipment

Positions:
Carman 1 (fatally injured)
Carman 2
Carman 3
Yard Clerk

Activity: Repairing defective freight cars, specifically replacing a broken truck bolster side-bearing cage, at the time of the incident.

EVENT

A Carman was fatally injured when a tank car shifted, fatally crushing him against the right No. 2 wheel.

SUMMARY FOR FE-07-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

A re-enactment of the incident revealed that Carman 1 was in an unsafe position between a jacked freight car and the partially removed freight car truck.

PCF No. 2

Railroad operating rules required that jacks be securely placed for this type of work. However, the blocking under the jack, on the north side of the tank car, was pressed into the ballast (stones) and soil, allowing the tank car to shift off the jacks.

PCF No. 3

Extreme temperature fluctuations from 4° F three consecutive days prior to the incident and up to 51° F at the time of the incident caused the ground to thaw from a frozen state and allowed the blocking to sink into the ballast. Subsequently, the jacks and car shifted.

REPORT: **FE-07-2002**

RAILROAD: Norfolk Southern Corporation (NS)

LOCATION: Frankfort, Indiana

DATE & TIME: March 6, 2002; 1:40 p.m., EST

EVENT[1]: A Carman was fatally injured when a tank car shifted, crushing him against the right No. 2 wheel.

EMPLOYEE:

Craft:	Maintenance of Equipment (MOE)
Activity:	Repairing a defective freight car
Occupation:	Carman
Age:	47 years
Length of Service:	23 years
Last Rules Training:	N/A
Last Safety Training:	March 6, 2002
Last Physical:	Within last six months

CIRCUMSTANCES PRIOR TO THE ACCIDENT

For the purposes of identifying the Carmen involved, Carman 1, 2, and 3 will be used. Carman 1 was fatally injured.

On March 6, 2002, Carmen 1 and 2 reported for duty at approximately 6:45 a.m., at NS's South Yard in Lafayette, Indiana. Carmen 3 reported for duty at approximately 6:30 a.m. After their morning stretching exercises, the Carmen reviewed the safety rule of the day and the incident report. The Lead Carman laid out their work assignments for the day. Carman 1 was to proceed to the east yard in Lafayette, Indiana to repair a locomotive. Carmen 2 and 3 would inspect and repair freight cars in the south yard. Carman 1's next assignment was to go to Frankfort, Indiana to repair defective freight cars with Carmen 2 and 3. The three Carmen loaded two pairs of wheels on the repair truck. Carman 1 drove the repair truck to Frankfort while Carmen 2 and 3 followed in a pick-up truck. They stopped en route for lunch about 11 a.m.

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[1] "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

They arrived at Frankfort at approximately 11:40 a.m. Carman 1 proceeded to the west end of Track 14 to establish Blue Signal Protection. The other two Carmen took care of the Blue Signal Protection at the east end of Track 14. Carman 1 proceeded to repair a crossover platform on a boxcar. The two other Carmen repaired a covered hopper, and then helped Carman 1 finish repairing the box car.

The Carmen separated a tank car (GATX 1367), which carried a load of coconut oil, from the rest of the cut of cars by using the power winch on the repair truck. Once they had separated the tank car, the Carmen positioned wood blocking on the ballast on the east end of the car and placed chock blocks under the wheels on the west end. They placed hydraulic jacks on the blocks, lifted the tank car by the jacks, and removed the freight car's truck to change the truck's wheels. The car was lowered to rest on the jacks. The truck was disassembled. At this time, Carman 3 took the pick-up truck to obtain parts to repair the truck. After Carman 3 returned, Carman 2 took the pick-up truck to retrieve another part. The new truck components were applied to the truck. After reassembling the truck, the car was again lifted. As the truck was being placed under the car, Carman 1 noticed a broken truck bolster side-bearing cage on the b-end, right side of the truck. Carman 1 told Carmen 2 and 3 to stop the truck with the No. 2 wheel axle positioned under the coupler of the car. He stated that this was to protect the car if it dropped. The side-bearing cage was removed and, while in the process of replacing the bolts, Carman 1 positioned himself between the truck bolster and the No. 2 wheel axle toward the north side of the truck side. The reason was they had problems holding the bolt in the truck bolster in order to secure the side-bearing cage.

The temperature was 51° F.

THE ACCIDENT

After securing the side-bearing cage, Carman 1 attempted to move from between the axle and the truck bolster. Carman 3 saw the car start to move and shouted to Carman 1, "LOOK OUT!" Before Carman 1 could move, the tank car shifted, crushing him against the right No. 2 wheel. Both Carmen called to Carman 1, but received no response. Carman 3 called the Yard Clerk on the radio and requested an ambulance and then left in the pick-up truck to guide the ambulance to the accident site. The Frankfort Fire Department EMT unit was the first to arrive on the scene. Carman 1 was pronounced dead at the scene by the Clinton County Coroner.

POST-ACCIDENT INVESTIGATION

A re-enactment of the incident revealed that Carman 1 was in an unsafe position between a jacked freight car and the partially removed freight car truck.

Prior to the incident, the blocking under the jack, on the north side of the tank car, was pressed into the ballast (stones) and soil. Extreme temperature fluctuations (from 4° F on March 3 through March 5 to 40° F on the afternoon of March 6 when the incident occurred) caused the ground to thaw from a frozen state and allowed the blocking to sink into the ballast.

Subsequently, the jacks and car shifted, crushing the Carman.

Following the accident/incident, the deceased's bodily fluids were tested for drugs and alcohol. The tests were negative.

APPLICABLE RULES

1206 Jacks must be securely placed. A block of wood or rubber must be inserted between the head of the jack and metal parts being jacked except when jacking rail. A proper jack handle must be used and must be removed when not in use except when jacking traction motors into position.

1301 When a car or other equipment with trucks is jacked and the trucks are removed, the jacked equipment must be supported by horses, trestles, or blocking before employees go under such equipment. **Exception**: Does not apply when in-floor jacking systems equipped with mechanical safety locking devices (lock bars and stop checks) are used.

1310 Before jacking up one end of a locomotive, car, or other rolling equipment, the wheels on the other end must be blocked. This does not apply if in-floor jacking equipment is used. Employees must block the wheels on the other end of such equipment after the lift has been made. They must remove the blocking before lowering the equipment.

SUMMARY FOR FE-09-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Norfolk Southern Corporation
Location: Claymont, Delaware
Region: 2

Month: March
Date: March 21, 2002
Time: 12:26 a.m., EST

Data for Fatally Injured Employee(s)

Locomotive Engineer
35 years old
13 years of service
Last rules training: Jan. 12, 2002
Last safety training: Feb. 26, 2002
Last physical: No record

Data for All Employees (Craft, Position, Activity)

Craft: Transportation and Engine

Positions:

Train No. H54
Locomotive Engineer
Conductor

Train Master

Amtrak Train No. 198
Engineer

Amtrak CETEC 4 Dispatcher

Activity: Boarding a standing locomotive after crossing an adjacent main line track

EVENT

The Locomotive Engineer was fatally injured when struck by a passenger train while trying to board a locomotive on an adjacent track.

SUMMARY FOR FE-09-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

The Locomotive Engineer complied with the railroad's operating rules when crossing the main line track, first looking both ways. However, as he was boarding the locomotive on the adjacent track, he had no time to react to the approaching passenger train, whose actual speed was not noted in the report, but whose maximum authorized speed was 110 mph.

PCF No. 2

Poor visibility, which contributed to the fatality, occurred because this section of track was located in an unlighted area. In addition, the curvature of the adjacent tracks away from one another prevented the Amtrak Engineer from noticing the Locomotive Engineer boarding the freight locomotive on the adjacent track until it was too late.

PCF No. 3

The Locomotive Engineer was too close to the adjacent track while climbing the ladder on the standing locomotive.

REPORT:	**FE-09-2002**	
RAILROAD:	Norfolk Southern Corporation (NS)	
LOCATION:	Claymont, Delaware	
DATE & TIME:	March 21, 2002; 12:26 a.m., EST	
EVENT[1]:	The Locomotive Engineer was fatally injured when struck by a passenger train while trying to board a locomotive on an adjacent track.	
EMPLOYEE:	Craft:	Transportation and Engine (T&E)
	Activity:	Boarding Locomotive
	Occupation:	Locomotive Engineer
	Age:	35 years
	Length of Service:	13 years
	Last Rules Training:	Jan. 12, 2002
	Last Safety Training:	Feb. 26, 2002
	Last Physical:	No Record

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On March 21, 2002, an NS Locomotive Engineer was fatally injured at 12:26 a.m. near Claymont, Delaware. The Engineer and Conductor on Train H54 reported for duty at Edgemore Yard, Delaware at 10 p.m. on March 20, 2002. Normally, this crew boarded its locomotive and train in the yard. On this evening, instructions were given to a yard crew to make up Train H54 and push it onto Amtrak's main track numbered 2F near Holly on the Northeast Corridor which is about four miles from Edgemore Yard. This change was due to Amtrak having put Track No. 2 out of service from Landlith to Wine. The train was made up with a locomotive on the north and south end in order to facilitate a push-pull operation.

Train H54 was placed on Track No. 2F at milepost 21.7 at about 10:34 p.m. on March 20, 2002. When the H54 crew members came on duty, they had the choice of waiting in the yard office or

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"Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

actually going to their train to wait there. The Conductor and Engineer agreed to go to the train and wait because there was a chance they would receive clearance before 4 a.m.

The accident occurred on Amtrak's Northeast Corridor, Mid Atlantic Region, at milepost 21.6 on Track No. 2F. This unlighted area was adjacent to Interstate 495. There were four main tracks in this area. Amtrak operated 95 passenger trains per day, and SEPTA operated 65 commuter trains per day. NS operated two local trains and two freight trains daily plus three coal trains per week. The maximum authorized speed for passenger trains on Tracks Nos. 2 and 3 was 110 mph, and on Tracks Nos. 1F and 2F, authorized speed was 60 mph. Freight trains were limited to 30 mph on all four tracks. Tracks Nos. 2 and 3 were equipped with concrete cross ties and Tracks Nos. 1F and 2F with standard wooden cross ties.

THE ACCIDENT

At 12:10 a.m. on March 21, 2002, the Train Master departed Edgemore Yard and drove the Engineer and Conductor to the train via highway vehicle, arriving at Track No. 2F at 12:22 a.m. Before exiting the vehicle to board the locomotive, the Engineer discussed with the Conductor the work which was about to be performed.

The Engineer secured two items from the rear of the vehicle, a personal cooler and a satchel type grip. The Train Master noticed that as he walked eastward towards locomotive NS 5393, the Engineer stopped short of Track No. 3 and looked both ways, then proceeded to the lead steps of the locomotive.

At this time, the Train Master drove the Conductor northward to the rear of the train. Upon arrival at the north end of the train, Amtrak Train No. 198 passed by northbound on Track No. 3. Immediately, the Amtrak Engineer reported to the Amtrak CETEC 4 Dispatcher that something was struck as it passed the head end of the standing freight train on Track No. 2F.

The Train Master and Conductor, upon hearing this emergency transmission, immediately returned southbound to the head end of the freight train. As they approached the lead locomotive, they found the Engineer on the ground next to the engine. The Train Master, who was certified in CPR, tried to resuscitate the Engineer, unsuccessfully.

POST-ACCIDENT INVESTIGATION

An inspection of the accident scene revealed the center of Track No. 3 was about 12 feet, 4 ½ inches from the center of Track No. 2F at the location of impact. As the Engineer crossed Track No. 3 to board the locomotive, witnesses claimed the Engineer looked both ways prior to crossing the live track. As the Engineer boarded the locomotive, he placed his personal belongings on the step of the locomotive to maintain a proper grip while ascending the ladder.

The freight locomotive was facing southbound at the beginning of a left hand curve which veered away from Track No. 3. The passenger train was traveling northbound on Track No. 3 and rounded a left hand curve, (facing south), which is further south of the freight locomotive.

The Amtrak Engineer had only a few seconds to notice the freight locomotive sitting on adjacent Track No. 2F. The deceased, apparently, had no time to react to the approaching passenger train.

APPLICABLE RULES

According to the Train Master and Conductor, the deceased looked in both directions prior to crossing Track No. 3, as required by the following railroad safety rule:

GR 32 (2) Employee must maintain a vigilant lookout for and detect the approach of a train, locomotive, or other railroad equipment moving in either direction.

SUMMARY FOR FE-10-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Southeastern Pennsylvania Transportation Authority
Location: Trevose, Pennsylvania
Region: 2

Month: March
Date: March 28, 2002
Time: 2:36 a.m., EST

Data for Fatally Injured Employee(s)

Overhead Maintainer, First Class/Lead Maintainer
36 years old
13 years of service
Last rules training: Feb. 26, 2002
Last safety training: Feb. 26, 2002
Last physical: Dec. 27, 1988

Data for All Employees (Craft, Positions, Activity)

Craft: Maintenance of Way

Positions:

Electric Traction (ET) Work Crew (Third Shift)
Employee-in-Charge (also Lineman, Third Class)
Lead Maintainer (also Overhead Maintainer, First Class)
Another Overhead Maintainer, First Class
Overhead Maintainer, Second Class

Headquarters Supervisor
SEPTA Wind Tower Operator
SEPTA "A" Desk Dispatcher at the Regional Rail Operations Center
Power Dispatcher at Wayne Junction, Philadelphia, PA

Freight Train Q190-27
Engineer
Conductor

SUMMARY FOR FE-10-02 CONTINUED

SELECTED FACTORS CONTINUED

Activities

The ET Work Crew was continuing a project they had started on March 24, 2002, removing a sectionalizing switch from a catenary pole.

EVENT

The Lead Maintainer was seriously injured from head trauma when struck by a passing train, dying two hours later.

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

FRA's investigation revealed that the ET employees did not sign SEPTA's form, acknowledging that they had received a briefing. Neither did they acknowledge an understanding of the on-track safety procedures to be used on the night of the incident. The EIC confirmed that a briefing had not been conducted, in non-compliance with Federal regulations.

PCF No. 2

FRA's investigators determined that the EIC failed to obtain foul time properly for the ET Work Group, in non-compliance with Federal regulations and NORAC Operating Rule 140. According to the Roadway Worker Manual, requirements for securing foul time include listing track designation, track limits, and time limits requested; repeating the request; and receiving confirmation from the issuing authority before implementing foul time. The request did not include the three specific elements above, which therefore could not be confirmed.

PCF No. 3

FRA's investigation revealed that the EIC failed to comply with Federal regulations governing radio procedures for ending transmissions.

PCF No. 4

FRA's investigation revealed that SEPTA only required a recorded examination as a method of qualifying a roadway worker to become an EIC. The EIC stated that he never received field training by a supervisor, nor did he demonstrate an understanding of the duties of an EIC.

SUMMARY FOR FE-10-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS CONTINUED

PCF No. 5

The investigation revealed the compliance testing program placed little emphasis on Roadway Worker Protection/On-Track Safety (RWP/OTS). The four employees directly involved in the incident had been observed 18 times in a 15-month period from January 2001 through March 2002, with only three observations regarding RWP/OTS rules. All were recorded as in compliance. The EIC was observed only three times in the 15-month period; he never received observation for radio procedures or RWP/OTS.

PCF No. 6

The investigation revealed the Lineman's inexperience with an important function of an EIC; during his one year in this role, he had obtained foul time only four times.

REPORT:	**FE-10-2002**	
RAILROAD:	Southeastern Pennsylvania Transportation Authority (SEPTA)	
LOCATION:	Trevose, Pennsylvania	
DATE & TIME:	March 28, 2002; 2:36 a.m., EST	
EVENT[1]:	The Lead Maintainer was seriously injured from head trauma when struck by a passing train, dying two hours later.	
EMPLOYEE:	Craft:	Maintenance of Way (MOW)
	Activity:	Removing a sectionalizing switch from a catenary pole
	Occupation:	Overhead Maintainer, First Class/Lead Maintainer
	Age:	36 years
	Length of Service:	13 years
	Last Rules Training:	Feb. 26, 2002
	Last Safety Training:	Feb. 26, 2002
	Last Physical:	Dec. 27, 1988

CIRCUMSTANCES PRIOR TO THE ACCIDENT

The Electric Traction (ET) Work Crew comprised one Lineman, Third Class, who was also the Employee in Charge (EIC), two Overhead Maintainers, First Class, one of which was the Lead Maintainer, and one Overhead Maintainer, Second Class. They all reported to Wayne Junction headquarters in Philadelphia, Pennsylvania prior to the start of the third shift (11 p.m. to 7 a.m.). The Supervisor at the headquarters gave the work assignment at approximately 11:30 a.m. The work assignment for the shift was to continue removing the J62 sectionalizing switch from catenary pole No. 21/9. This same crew had previously worked this project twice, on March 24 and 25, 2002.

[1] "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

The 4-man crew left the headquarters for the work site in two vehicles. Utility truck No. 216 was occupied by the EIC and the Overhead Maintainer, Second Class. The second vehicle, a hi-rail bucket truck No. OPS4022, was occupied by the Overhead Maintainer, First Class, and the Lead Maintainer. The crew had arranged to meet at Langhorne Train Station, on Bellevue Ave, Langhorne, Pennsylvania, at milepost 23.90, north of the work site, to set the hi-rail truck on the track.

At approximately 12:40 a.m., the crew met at the Langhorne Train Station, and the EIC called the Dispatcher to ask permission to take SEPTA Track No. 2 out of service from CP Wood to Jenkin Interlocking. Permission was granted by NORAC Form−D No. 50006, effective12:49 a.m. The EIC instructed the Overhead Maintainer, First Class, and the Lead Maintainer occupying truck No. OPS4022 to set the truck on Track No. 2 and proceed south to the work location at milepost 21.38. At 1:07 a.m., the EIC received power permit No. 331 to remove the electric traction power from Tracks Nos. 1 and 2 between CP Wood and Neshaminy Interlocking. The EIC and the Overhead Maintainer, Second Class, proceeded to the work site in the truck No. 216 via the highway and parked the truck on the right of way next to Track No. 1, adjacent to the work site.

After arriving at the work site with the hi-rail bucket truck occupying Track No. 2 facing south, The Overhead Maintainer, First Class, and Lead Maintainer went up in the bucket to the catenary structure. The EIC and the Overhead Maintainer, Second Class, remained on the ground as ground hands. The Overhead Maintainer, First Class, and Lead Maintainer in the bucket were dismantling the J62 switch location, removing the mechanical switch, and operating pipeline. During the procedure, it became necessary to reach further with the bucket to complete the removal of the pipeline, which would require foul time on the CSX single track. The Overhead Maintainer, First Class exited the bucket climbing onto the catenary structure and told the Lead Maintainer in the bucket to ask the EIC to get foul time on the CSX track. While waiting for permission to foul the CSX single track, the Overhead Maintainer on the structure continued to cut the operating pipeline free and hand it to the Lead Maintainer in the bucket remaining clear of the CSX single track.

The EIC called the operator at the SEPTA Wind Tower for permission to foul the CSX single track and was referred to the SEPTA "A" Desk Dispatcher at the Regional Rail Operations Center (RROC). The SEPTA "A" Desk Dispatcher received the request to foul the CSX single track from the EIC via phone and informed him he would call CSX and get back to him on the radio. The "A" Desk Dispatcher then contacted the Operator at Wind Tower, asking about the location of Freight Train Q190 and told him to contact the EIC via radio and tell him there was a south bound freight train heading towards him. The Operator at Wind Tower then contacted the EIC via radio to inform him of the southbound freight train. The EIC responded "ROGER" to the information from the Operator at Wind Tower on the radio and wrote on the power permit form "Received at 2:24." The EIC notified the Overhead Maintainer, Second Class, and the Lead Maintainer in the bucket that permission had been received to foul the CSX track.

The Lead Maintainer in the bucket operated the bucket east across the CSX single track and next to the catenary structure. The Overhead Maintainer, First Class, on the catenary structure and the

Lead Maintainer in the bucket proceeded to remove the operating pipeline from the vertical part of the catenary structure.

The accident site comprised an elevated railroad approximately 80 feet above the surrounding area. Located at the south end of a bridge over the Neshaminy Creek containing three parallel tracks, the CSX single track posted at 50 mph, SEPTA Tracks No. 1 and No. 2 both posted at 70 mph for passenger trains and 40 mph for freight trains. The ground surface was stone ballast. Overhead electric traction wires directly above Tracks No. 1 and No. 2 were energized at 13,000 volts AC. The electric traction wires were suspended from a horizontal steel member supported by two steel vertical structures imbedded in the ground on the outside of the tracks. The Neshaminy Falls Passenger Train station was approximately 300 feet south of the work site and illuminated with street and parking lot lights. There was a creek bed with trees on the east side and mature woods on the west side. The site was a semi-isolated location in the suburbs of Philadelphia. The hi-rail vehicle No. OPS4022 was illuminated with spotlights, two yellow rotary beacons, one on each side at the center of the vehicle. The vehicle also displayed one yellow strobe light bar on the front and one yellow hazard light bar on the rear.

The weather on the morning of March 28, 2002 was 40° F, with clear skies.

THE ACCIDENT

The Overhead Maintainer, Second Class, who was working as the ground hand, observed a train heading south towards the work site and informed the EIC. The EIC excitedly called the Operator at Wind Tower on the radio. Prior to receiving an answer from Wind Tower, the EIC and the Overhead Maintainer on the ground started yelling to the Lead Maintainer, who was elevated in the bucket, to move out of the way of the approaching train. The Lead Maintainer in the bucket proceeded to move the bucket from the path of the approaching train on the CSX track.

As CSX Freight Train Q190-27 approached at 48 mph, the *Engineer* observed an illuminated work site ahead of him and sounded the horn as a warning. As the train neared the work site, the Engineer observed equipment fouling the track he was on and initiated an emergency break application. Both the Engineer and Conductor dove to the floor of the cab.

At approximately 2:36 a.m., the train struck the bucket occupied by the Lead Maintainer, impacting the right side of the Engineer's windshield on Engine No. 8739. The victim was ejected from the bucket, and came to rest near the driver's side rear tire between the CSX single track and the SEPTA Track No. 2.

The Engine No. 8739 came to a complete stop approximately 1,700 feet south of the impact point with the rear of the train approximately 480 feet south of the impact point. The Engineer of CSX Train Q190-27 transmitted an emergency radio message to the CSX "NI" Dispatcher located in Albany, New York, informing the Dispatcher of the accident.

The Overhead Maintainer, First Class, on the catenary structure contacted 911 via cell phone. The EIC contacted the Power Dispatcher located at Wayne Junction, Philadelphia, Pennsylvania to inform him of the accident. The EIC was involved in multiple phone calls with supervisors

concerning the accident. Officers from the Bensalem Township Police Department arrived at the scene. The officers took a statement from the Overhead Maintainer, First Class, who was stationed on the catenary structure at the time of the impact. Bensalem Township emergency medical personnel arrived at the scene, followed by two SEPTA police officers. Also representing SEPTA at the accident scene were the Director of Systems Safety, Investigator Systems Safety, Line Director, and Deputy Line Director.

The victim sustained sufficient trauma to the head to preclude any attempt to revive or sustain life. The coroner pronounced the victim dead at the scene at 4:45 a.m. on March 28, 2002.

POST-ACCIDENT INVESTIGATION

Accident Site

The FRA inspection of the site revealed no unusual or contributing factors to the accident. The railroad terrain is level with an unobstructed view of approximately 3,800 feet to the point of impact for a southward moving train.

Bucket Truck No. OPS4022

The FRA inspection of the vehicle No. OPS4022 revealed no unusual or contributing factors to the accident. The vehicle was new and in service in October 2001. The vehicle was assigned to the same ET crew since January 2002, and they had been trained on its use. The training session was conducted by the contractor supplying the truck on March 5, 2002 and consisted of hands-on experience utilizing the vehicle at the Wayne Junction facility.

CSX Engine No. 8739

The FRA Inspection of the CSX Engine No. 8739 revealed no contributing factors to the accident. Review of the data from the event recorder on the engine revealed no remarkable events. The Engineer appeared alert and in control of the train responding to previous highway grade crossings, sounding the horn. The Engineer maintained the posted speed for the track on which he was operating. The Engineer responded to the train inspection device (hot box detector: HBD) at milepost 24.00, properly repeating the message transmitted by the HBD. The Engineer approached the illuminated work-site, sounding the horn approximately 2,200 feet prior to reaching it. The Engineer initiated an emergency break application approximately 250 feet prior to the point of impact.

Manuals/Rules

FRA conducted a review of SEPTA Roadway Workers Protection (RWP) Manual SRW-1, NORAC Operating Rules, and SEPTA Safety Rules S7-C. FRA conducted interviews and reviewed recorded tapes of radio conversations for compliance with Federal and SEPTA rules.

The RWP manual covers the duties of the EIC. It mandates job briefings and the signing of SEPTA form F-1454 by all employees participating in the job briefing. In an additional rule on

job briefings, it specifies a job briefing is not complete until all employees acknowledge and understand the on-track protection procedures being used. The job briefing is also a requirement of the NORAC Operating Rules. The FRA investigation revealed that the ET employees did not sign the SEPTA form F-1454, nor did they acknowledge an understanding of the on-track safety procedures used on the night of the accident. In the FRA interview on May 15, 2002, the EIC stated that a job briefing was not conducted, and this constitutes non-compliance with 49 CFR Part 214.315.

The roadway worker manual covers the requirements of securing foul time, listing the three elements necessary, track designation, track limits, and time limits, and the requirement to repeat this permission and be confirmed by the issuing authority before foul time is effective. It also refers the employee to Norac Operating Rule 140 that states the same information. FRA's investigators determined that the EIC had failed to properly obtain foul time for the ET work group. This constitutes non compliance with 49 CFR Part 214.335.

The NORAC Operating Rules, in addition to covering the requirements for foul time and job briefings, also mandates proper radio/telephone procedures. The radio/telephone procedures under Rule 705 require that all transmissions be repeated by the employee receiving them, and employees must not take action until they are certain that all conversations have been heard, understood, and acknowledged. FRA's review of radio communications revealed that the EIC failed to comply with the procedures of NORAC Rule 705 and 49 CFR Part 220.35. The review also revealed that the Dispatcher and the EIC both failed to comply with NORAC Rule 140 and 49 CFR Part 214.323, regarding repeating permission and confirmation before foul time becomes effective.

Training

The ET employees involved had recently (within 30 days) attended an annual re-certification class for Roadway Worker Protection (RWP) and Norac Operating Rules. All displayed proficiency by passing an exam. Any question not answered correctly on the exam was reviewed with the individual. The class lasted approximately six hours. The instructor's manual for the RWP re-certification class (102 pages) was supplemented with a power point presentation with the same number of slides. Four of the slides were on foul time requirements and covered the procedure. Two of the slides were on job briefings; the second depicted a copy of the SEPTA job briefing documentation sheet that must be filled out by the EIC and signed by all participants. Four slides were on proper radio/telephone usage. One of the four slides contained radio transmission and reception procedures. This slide stated to repeat all transmissions that could affect the safe operation of train movements and make sure all communications were understood.

The annual NORAC operating rules re-certification program for the Operators and Dispatchers follows a similar course line as the training for the ET department. The instructor manuals cover the rules for foul time and proper radio/telephone procedures. The procedure emphasizes the necessity for repeating the permission to foul, giving track designation, track limits, and time limits before foul time becomes effective.

FRA's investigation revealed that SEPTA only required that a recorded examination be used as a method of qualifying a roadway worker to become an EIC. The EIC stated that he was never trained in the field by a supervisor, nor did he demonstrate his ability and understanding of the duties of an EIC. The EIC performed his duties as shown by his peers and past practice, not by the training received. This employee has been the EIC for approximately one year and had only obtained foul time approximately four times.

Accepted Practices

As revealed during the interviews and the review of audiotapes from March 26 and 28, adherence to the rules was not consistent or enforced on a regular basis. In his second interview, the EIC stated job briefings were not performed. The EIC Supervisors would assign jobs without discussing RWP. The EIC acknowledged being trained on his responsibility to perform job briefings, but to his knowledge never received or gave one.

The recorded tapes of the radio communications revealed that compliance with Federal and SEPTA radio rules was not enforced. On March 26, 2002, the Operator at Wind Tower granted foul time without the receiving employee repeating the permission and being confirmed by the Operator. Also revealed was the lack of required radio key words to end radio transmissions.

Compliance Testing Program

The investigation revealed that SEPTA had a compliance testing program. This program met the requirements of CFR 49, Part 214.303, requiring a procedure to monitor the RWP program. The requirements for monitoring each management position were determined by the respective departments.

Analysis of the data from their program showed that the four employees directly involved in the accident had been observed 18 times in a 15-month time frame from January 2001 through March 2002. Eleven of the observations were performed at headquarters locations. Only three of the 18 observations pertained to RWP rules. All of the 18 observations were recorded as in compliance.

The EIC was observed three times in the 15-month period. Two observations on the EIC were for compliance with Rule G (Drug and Alcohol) during his annual RWP/NORAC Operating Rules class. His other observation was for compliance using personal protective equipment. He was never observed for safety-sensitive rules dealing with radio procedures, RWP, or NORAC operating procedures.

Other Findings

The autopsy report listed the cause of death as head injuries.

The SEPTA Safety Department conducted an internal investigation of the accident. They determined the cause to be "procedures for operating/using equipment not followed."

The Hours of Service employees, Engineer, Conductor, and Dispatcher, were tested under FRA's required post-accident toxicological testing. The three ET employees were tested under FRA's post-accident toxicological testing. The victim was tested as a fatality under FRA regulations. All tests were negative for drugs and alcohol.

APPLICABLE RULES

SEPTA Roadway Worker Protection Manual

- **SRW 3 General Responsibilities of Individual Roadway Workers**

  Roadway workers must follow the on-track safety rules and procedures. Do not foul a track except when necessary for the performance of duty. Make sure on-track safety is being provided before fouling a track.

- **SRW 5 Job Briefings**

  A Job Briefing Documentation Sheet, SEPTA Form F-1454 must be completed by the employee-in-charge and signed by all participating in the job briefing.

- **SRW 15 Designated Employee-In-Charge**

  The employee-in-charge is responsible for a safe operation and must exercise every reasonable precaution to provide protection.

- **SRW 17 Conduct a Job Briefing**

  The employee-in-charge must conduct a job briefing as prescribed by the operating rules before any track is fouled. The job briefing is not complete until all employees acknowledge an understanding of the on-track protection procedures being used.

- **SRW 19 Roadway Work Groups** (Designation of Employee Responsibility for providing On-Track Protection)

  The designated employee must be qualified on the operating and safety rules and procedures. Also, the employee must be qualified on the physical characteristics of the territory where protection will be provided.

- **SRW 54 Controlled Tracks**

  Trains must be fully protected against any known condition that may interfere with their safe passage. 2. If the work will not disturb the track or catenary structure, the Dispatcher may verbally authorize foul time in accordance with Rule 140, Form D, lines 4 and 5, and foul time may be issued to employees who are qualified on the operating rules and physical characteristics of the territory involved.

- **SRW 56 Foul time**

  Whenever foul time is authorized, the following procedures will apply: **b. Permission to Foul:** Permission to foul the track must include the following information: track designation; track limits (between/at); and time limits. The receiving employee must repeat this permission and the Dispatcher or Operator must then confirm it before the foul time becomes effective.

SEPTA NORAC Operating Rules

- **Rule 4 Job Briefings**

  When reporting for duty, employees whose duties require coordination with other employees must hold a job briefing to review operational and safety conditions. If these conditions change, employees must hold an additional job briefing to discuss the new conditions.

- **Rule 140 Foul time**

  Foul time may be issued only by the Dispatcher or Operator when authorized by the Dispatcher. **b. Permission to Foul** Permission to foul the track must include the following information: track designation; track limits (between/at); and time limits. The receiving employee must repeat this permission, and the Dispatcher or Operator must then confirm it before the foul time becomes effective.

- **Rule 702 Requirements for Track Cars and Roadway Workers**

  Each employee assigned to provide on-track safety for roadway workers and each lone worker must have immediate access to a working radio. When access to a working radio is not available, the employee must be within hearing range of a radio capable of monitoring transmissions from train movements in the vicinity.

- **Rule 705 Radio Transmission and Reception Procedures**

  All transmissions must be repeated by the employee receiving them. Employees must ensure that radio contact with the proper person has been made and must not take action until certain that all conversations with them has been heard, understood and acknowledged. Any radio communication that is not fully understood or completed in accordance with the requirements with these rules shall not be acted upon and should be treated as though not sent.

- **Rule 706 Radio Location and Monitoring**

  When their duties involve the use of radio, employees must have the radio on and tuned to the proper channel at all times. The volume must be adjusted so that all transmissions can be heard.

- **Rule 708 Radio Messages and Code Words**

  Communications must be as brief as possible and must use these key words: "ROGER," "OVER," "OUT," and "EMERGENCY."

SEPTA Safety Rules

- **3801**

  The following procedures will govern identification and content of messages when using radio. Communications must be as brief as possible using these key words: "ROGER," "OVER," and "OUT."

- **3804**

  Equipment and fixed points when equipped with radio and attended, must have a radio on and tuned to the proper channel at all times, with the volume control adjusted to ensure reception of all calls.

- **3805**

  Employees must ensure being in communication with the proper persons and must not take action until certain that all conversations concerning them has been heard, understood, and acknowledged.

- **3806**

  Any radio communication which is not fully understood or completed in accordance with the requirements of these rules, shall not be acted upon and shall be treated as though not sent.

49 CFR Part 214 Roadway Workplace Safety

- **214.313 Responsibility of Individual Roadway Workers**

  (a) Each roadway worker is responsible for following the on-track safety rules of the railroad upon which the roadway worker is located.

  (b) A roadway worker shall not foul a track except when necessary for the performance of duty.

(c) Each roadway worker is responsible to ascertain that on-track safety is being provided before fouling a track.

C **214.315 Supervision and Communication**

(a) When an employer assigns duties to a roadway worker that call for that employee to foul a track, the employer shall provide the employee with a job briefing that includes information on the means by which on-track safety is to be provided, and instructions on the on-track safety procedures to be followed.

(b) A job briefing for on-track safety shall be deemed complete only after the roadway worker has acknowledged understanding of the on-track safety procedures and instructions presented.

(c) Every roadway work group whose duties require fouling a track shall have one roadway worker designated by the employer to provide on-track safety for all members of the group. The designated person shall be qualified under the rules of the railroad that conducts train operations on those tracks to provide the protection necessary for on-track safety of each individual in the group. The person may be designated generally, or specifically for a particular work situation.

C **214.319 Working Limits, Generally**

Working limits established on controlled track shall conform to the provisions of 214.321 Exclusive Track Occupancy, 214.323 Foul Time, or 214.325 Train Coordination. Working limits established on non-controlled track shall conform to the provisions of 214.327 Inaccessible Track. Working limits established under any procedure shall, in addition, conform to the following:

(a) Only a roadway worker who is qualified in accordance with 214.353 of this part shall establish or have control over working limits for the purpose of establishing on-track safety.

C **214.323 Foul time**

Working limits established on controlled track through the use of foul time procedures shall comply with the following requirements:

(b) Each roadway worker to which foul time is transmitted orally shall repeat the track number, track limits, and time limits of the foul time to the issuing employee for verification before the foul time becomes effective.

- **214.335 On-track Safety Procedures for Roadway Work Groups**

  No employer subject to the provisions of this part shall require or permit a roadway worker who is a member of a roadway work group to foul a track unless on-track safety is provided by either working limits, train approach warning, or definitive train location in accordance with the applicable provisions of 214.339, 214.321, 214.323, 214.325, 214.327, 214.329, and 214.331 of this part.

- **214.343 Training and Qualification, General**

  (a) No employer shall assign an employee to perform the duties of a roadway worker, and no employee shall accept such assignment, unless that employee has received training in the on-track safety procedures associated with the assignment to be performed, and that employee has demonstrated the ability to fulfill the responsibilities for on-track safety that are required of an individual roadway worker performing that assignment.

- **214.353 Training and qualification of roadway workers who provide on-track safety for roadway work groups**

  (a) The training and qualification of roadway workers who provide for the on-track safety of groups of roadway workers through establishment of working limits or the assignment and supervision of watchmen/lookouts or flagmen shall include, as a minimum:

    (4) The relevant physical characteristics of the territory of the railroad upon which the roadway worker is qualified.

<u>49 CFR Part 220 Radio and Wireless communications Procedures</u>

- **220.035 Ending a transmission**

  (a) At the close of each transmission to which a response is expected, the transmitting employee shall say “Over?” to indicate to the receiving employee that the transmission is ended.

  (b) At the close of each transmission to which no response is expected, the transmitting employee shall state his identification followed by the word “Out” to indicate to the receiving employee that the exchange of transmissions is complete.

SUMMARY FOR FE-11-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Delaware and Hudson Railway Company
(subsidiary of the Canadian Pacific Railroad)
Location: Binghamton, New York
Region: 1

Month: April
Date: April 9, 2002
Time: 8:15 p.m., EST

Data for Fatally Injured Employee(s)

Car Inspector
52 years old
25 years of service
Last rules training: Nov. 13, 2001
Last safety training: Nov. 13, 2002
Last physical: Unknown

Data for All Employees (Craft, Positions, Activity)

Craft of Fatally Injured Employee: Maintenance of Equipment (MOE)

Positions of all Employees (MOE and Transportation and Engine):

MOE Personnel
Mechanical Manager
Fatally Injured Car Inspector
Injured Car Inspector
Third Car Inspector

Yard Crew
Locomotive Engineer
Conductor
Brakeman

Yard Master
Terminal Yard Coordinator
Area Manager

SUMMARY FOR FE-11-02 CONTINUED

SELECTED FACTORS CONTINUED

Activities

The fatally injured Carman was replacing a freight car coupler knuckle with assistance from the injured Carman, while the yard crew was conducting switching operations.

EVENT

A Car Inspector was crushed by a free rolling car.

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

The yard crew shoved and released Tank Car CITX 14344 en route to a track where one Car Inspector was replacing a coupler knuckle while another was holding the coupling lever. The *free rolling, unsecured car* impacted the car on which they were working, causing it to roll south, knocking one of the Car Inspectors to the ground, then rolling over him and severing both legs. This Car Inspector died shortly afterwards. The other Car Inspector sustained injuries to his face, shoulder, and back.

PCF No. 2

A re-enactment of the incident demonstrated that the tank car, traveling between 4 and 5 mph when rolling freely down Track No. 16, could not be heard by the Car Inspectors.

PCF No. 3

The Car Inspectors were unable to see the freely rolling tank car for two reasons: the incident occurred after sunset in a dimly lighted area; and Car CITX 14344 was a black tank car approaching from a direction where it was blocked from the view of the Car Inspectors.

PCF No. 4

Employee statements and photographs depicted that the blue signal equipment was still in the vehicle at the time of the incident; therefore no protection was provided, in non-compliance with Federal regulations and the railroad's operating rules.

SUMMARY FOR FE-11-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS CONTINUED

PCF No. 5

Workers failed to assure that each remotely and/or manually controlled switch was lined against movement to the track on which they were working and locked with an effective locking device.

REPORT:	**FE-11-2002**	
RAILROAD:	Delaware and Hudson Railway Company (DH) Subsidiary of Canadian Pacific Railroad (CP)	
LOCATION:	Binghamton, New York	
DATE& TIME:	April 9, 2002; 8:15 p.m., EST	
EVENT[1]:	A Car Inspector was crushed by a free rolling car.	
EMPLOYEE:	Craft:	Maintenance of Equipment (MOE)
	Activity:	Replacing Freight Car Coupler Knuckle
	Occupation:	Car Inspector
	Age:	52 years old
	Length of Service:	25 years
	Last Rules Training:	Nov. 13, 2001
	Last Safety Training:	Nov. 13, 2001
	Last Physical Examination:	Unknown

The following railroad personnel were on duty the day of the incident: Mechanical Manager; the fatally injured Car Inspector; the injured Car Inspector; another on-duty Car Inspector; Yard Master; Terminal Yard Coordinator; Area Manager; and yard crew comprising a Locomotive Engineer, Conductor, and Brakeman.

CIRCUMSTANCES PRIOR TO THE ACCIDENT

The Mechanical Manager had worked the day shift and was at home at the time of the incident. The fatally injured Car Inspector reported to work at 1 p.m., following 16 hours off duty. Until the time of the incident, the fatally injured Car Inspector performed inbound and outbound inspections. The injured Car Inspector reported for duty at 3 p.m., following 16 hours off duty. Until the time of the incident, the injured Car Inspector performed inbound and outbound inspections. Another on-duty Car Inspector reported for duty at 3 p.m., following two days off duty. Until the time of the accident, he had performed inbound inspections.

The Yard Master reported for duty at 3 p.m., following 16 hours off duty. Until the time of the accident, he supervised switching and inspection assignments in the yard. The Terminal Yard

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[1] "Event is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

Coordinator reported for duty at 6:30 p.m., following 12 hours off duty. Until the time of the accident, he managed the yard operations. The Area Manager had worked the day shift in the Saratoga, New York area, and was off duty at the time of the accident.

The yard crew (Locomotive Engineer, Conductor, and Brakeman) reported for duty at 3:59 p.m. The Locomotive Engineer had 10 hours, 29 minutes off duty after working 12 hours; the Conductor stated he had received the proper rest; and the Brakeman had been off duty for 16 hours.

Prior to the accident, the yard crew was transported to the "cab track" where the Engineer performed an inspection on the locomotives. The crew performed routine switching activities at the north end of the yard until going to the yard office for a coffee break at approximately 7:40 p.m.

General Operations and Procedures at Binghamton Yard

1. Binghamton Yard is located in the town of Conklin, Broome County, New York and is a main classification yard for the D&H.

2. Binghamton Yard receives rail freight traffic from the Canadian Pacific Railroad (CP) and interchange rail traffic from the Norfolk Southern Railway (NS) and New York Susquehanna & Western Railroads (NYS&W).

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3. Freight cars are classified into a 3-group, 15-track, bowled yard and switched onto tracks (with larger blocks of cars) or kicked over a hump and lined onto designated tracks (no retarders).

4. Binghamton Yard has a locomotive repair facility located north (compass direction) of the Classification Yard. The car repair facility is staffed only during the day shift with movements into and out of the facility controlled by Mechanical Department personnel. Blue signal protection is provided to protect workers within the facility during hours of operation. During the evening hours and night shift, blue signal protection is removed to allow crews access to the tracks within the facility.

5. During the evening and night shifts, Car Inspectors are assigned to work in the yard performing mechanical inspections, train air brake tests, and minor repairs. Personnel routinely wait inside a trailer located near the car repair facility for assignments from the Yard Master. Small ATV type vehicles (a.k.a "mules") are used by Car Inspectors to carry materials and to get around in the yard. When working on equipment, Car Inspectors are to provide themselves with blue flag protection as specified by DH Operating Rules and 49 CFR, Part 218, Subpart B.

6. Yard Tracks Nos. 2 through 15, are used for switching freight cars and classifying outbound trains. Tracks Nos. 16 and 17 are routinely used for storing "bad order" cars destined for the car repair facility and to perform minor repairs.

The area around the accident site was dimly lit and constructed of typical yard track ballast. (In contrast to ballast stone used on main or side tracks, which averages 1½ to 2 inches, typical yard ballast, commonly called walking stone, is smaller and more granular, and easier and safer for walking

because the ground surface maintains a smoother surface longer.) Weather conditions at the time of the accident was overcast, with scattered rain showers. The temperature was 46° F.

THE ACCIDENT

At approximately 7:50 p.m., the Conductor of the yard crew received instructions from the Yard Master (via the switch list) to switch 35 cars located on the No. 2 Runner Track. At approximately 8:05 p.m., the yard crew began switching the cars and placed 16 cars on Track No. 15. The next nine cars were switched onto various tracks (Nos. 9, 10, and 12). The tenth car (CTX 14344) was a "bad order" car destined to Track No. 16 for repairs. At approximately 8 p.m., the Yard Master telephoned the Car Inspector and instructed him to replace a coupler knuckle on car SAN 505, located on Track No. 16. A short time later, the fatally injured Car Inspector departed the trailer en route to Track No. 16. The injured Car Inspector arrived to assist the fatally injured Car Inspector. At approximately 8:20 p.m., the yard crew shoved and released Tank Car CITX 14344 en route to Track No. 16. The car was released approximately 359 feet from the switch controlling access to Track No. 16. At the same time, the fatally injured Car Inspector was replacing the coupler knuckle on the south end of Car SAN 505, and the injured Car Inspector was holding the coupling lever. The free rolling car impacted the north end of standing Car SAN 505, causing it to roll south. The impact knocked the fatally injured Car Inspector to the ground, and the car rolled over him, severing both legs. The injured Car Inspector was knocked clear, but sustained injuries to his face, shoulder, and back.

The injured Car Inspector contacted the Yard Master via radio to report the accident and requested medical assistance. Emergency responders arrived at the scene at approximately 8:30 p.m., but were unable to save the life of the fatally injured Car Inspector.

POST-ACCIDENT INVESTIGATION

On the following day (April 10), FRA and D&H Officials conducted a re-enactment of the accident using the involved equipment. Car CITX 14344 was released in motion to Track No. 16 at a speed of 4 to 5 mph as supported by the current recorder data download (4.4 mph). CITX 14344, when rolling freely down Track No. 16, could not be heard. The incident occurred after sunset in a dimly lighted area; also to be taken into consideration is the fact that CITX 14344 was a black tank car which was switched onto the north end of standing car SAN 505 as the Car Inspectors were working the south end of the car. It is apparent that they neither saw nor heard the car prior to impact. Employee statements and photographs depicting the blue signal protection still in the vehicle revealed that no protection was provided.

Carrier records indicated that the deceased employee received annual training on railroad safety rules including blue signal protection procedures. The employee last attended safety training sessions on November 13, 2001. Railroad records indicated that the employee had previously received disciplinary action for failure to follow proper blue signal protection procedures.

FRA post-accident toxicological test results were negative.

APPLICABLE RULES

49 CFR Part 218, Subpart B (Blue Signal Protection of Workers)

When workers are on, under, or between rolling equipment on tracks other than main tracks:

(a) A blue signal must be displayed at or near each manually operated switch providing access to that track.

(b) Each manually operated switch providing access to the track on which the equipment is located must be lined against movement to that track and locked with an effective locking device.

c) The person in charge of the workers must have notified the operator of any remotely controlled switch that work is to be performed and have been informed by the operator that each remotely controlled switch providing access to the track on which the equipment is located has been lined against movement to that track and locked as prescribed in 218.30.

(d) If rolling equipment requiring blue signal protection as provided for in this section is on a track equipped with one or more crossovers, both switches of each crossover must be lined against movement through the crossover toward that rolling equipment, and the switch of each crossover that provides access to the rolling equipment must be protected in accordance with the provisions of paragraphs (a), and (b), or (c) of this section.

(e) If the rolling equipment to be protected includes locomotives, a blue signal must be attached to the controlling locomotive at a location where it is readily visible to the engine man or operator at the controls of that locomotive.

Railroad Operating Rule 16 (b) - Blue Signal Protection of Workers

(b) **Responsibilities of Workmen**

Before going on, under, or between engines and/or cars, workmen must take the actions prescribed below. Each craft or group of workmen must display its own blue signal.

If the equipment is on track other than main track or controlled siding:

1. Attach a blue signal to the controlling engine(s) at a location where it will be clearly visible to an employee at the controls of that engine.

2. Line each hand-operated switch providing access to the track against movement to the track, and lock each switch with an effective locking device.

SUMMARY FOR FE-12-02
SELECTED POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Union Pacific Railroad Company
Location: Pine Bluff, Arkansas
Region: 5

Month: May
Date: May 4, 2002
Time: 8:40 a.m., CST

Data for Fatally Injured Employee(s)

Switchman
53 years old
Two years, four months of service
Last rules training: Jan. 23, 2002
Last safety training: April 3, 2002
Last physical: Nov. 2, 1999

Data for All Employees (Craft, Positions, Activity)

Craft: Transportation and Engine

Positions:

Crew for Yard Assignment YPB01-04
Switchman
Conductor
Engineer

Yard Master

Activity

Switching

SUMMARY FOR FE-12-02 CONTINUED

EVENT

A Switchman was crushed between rail cars while attempting to adjust knuckles.

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

After the locomotive and four cars had come to a stop, the Switchman stepped between the fourth car and the remaining 35 cars north of his position. As he attempted to adjust the coupler on the fourth car, a cut of unsecured cars rolled from the north and struck him, fatally injuring him. The Switchman was in non-compliance with Union Pacific safety rules prohibiting him from going between or in front of an engine or car to arrange knuckles or couplers, to manipulate other appliances, or for any other reason.

PCF No. 2

The Switchman had failed to inspect the cars not coupled to the locomotive to ensure that they were secure, applying hand brakes if necessary. He also failed to separate the cars by a minimum of 50 feet.

PCF No. 3

The Switchman was in non-compliance with Union Pacific safety rules when he failed to communicate with his crew before fouling the track.

REPORT: **FE-12-2002**

RAILROAD: Union Pacific Railroad Company (UP)

LOCATION: Pine Bluff, Arkansas

DATE & TIME: May 4, 2002; 8:40 a.m., CST

EVENT[1]: The employee was crushed between rail cars while attempting to adjust knuckles.

EMPLOYEE:

Craft:	Transportation and Engine (T&E)
Activity:	Aligning the knuckles of two rail cars
Occupation:	Switchman
Age:	53 years
Length of Service:	2 years, 4 months
Last Rules Training:	Jan. 23, 2002
Last Safety Training:	April 3, 2002
Last Physical:	Nov. 2, 1999

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On May 04, 2002, at 7 a.m., three UP train crew members reported for duty at the Pine Bluff Terminal in Pine Bluff, Arkansas, after having received their statutory off-duty rest periods. Three crew members, an Engineer, Conductor, and Switchman, were assigned to perform switching operations on Yard Assignment YPB01-04. Their duties required them to assemble trains by removing rail cars from the bowl tracks and placing them onto outbound tracks. The bowl tracks descended north to south and had a hump located on the north end of the yard.

After switching two trains, the crew members were instructed by the Yard Master to proceed to Track No. 31, where they were ordered to couple all 39 cars on the track. The locomotive and crew headed north onto Track No. 31 from the south end and coupled onto the first car. The Engineer was sitting on the east side at the controls of the locomotive. The Conductor and Switchman were standing on the nose platform at the north end of the locomotive. YPB01-04 coupled to the first car on the south end of the cut, and the Switchman dismounted the

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[1] "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

locomotive on the east side. The Conductor returned to the locomotive cab and waited with the Engineer.

The weather was cloudy, and the temperature was 61° F.

THE ACCIDENT

The Switchman dismounted the locomotive, instructed the Engineer, via radio, to "stretch" the cars, and then commenced walking north. The locomotive and four cars made a reverse southward movement, and the Switchman instructed the Engineer, "That'll do 01." The locomotive moved south a distance of 34 feet before coming to a complete stop. The Engineer stopped, centered the reverser, and applied the locomotive's independent brake. The Engineer and Conductor stated that they did not move the locomotive again and waited approximately 15 minutes without any communication from the Switchman. The Conductor attempted to contact the Switchman, via radio, on several occasions but received no response. At approximately 8:40 a.m., the Conductor dismounted the locomotive and walked north four car lengths where he discovered the Switchman's body pinned between the knuckles of the fourth and fifth cars. The Conductor notified the Yard Master on the radio that a man was coupled and requested assistance. The Engineer heard the radio transmission, dismounted the locomotive, and walked north to where the Conductor and Switchman were located. The Engineer and Conductor returned to the locomotive and waited for Emergency Services.

POST-ACCIDENT INVESTIGATION

Through interviews and analysis of data, the investigators concluded that prior to the accident, the YPB01-04 headed north onto Track No. 31 and coupled onto the first car of the cut. The Switchman then dismounted the locomotive on the east side, instructed the Engineer on the radio to stretch the cars, and then began walking north. The next instruction received from the Switchman was to stop the movement. The locomotive and four cars came to a stop, having moved a total of 34 feet. The Engineer stated that he did not make another movement and the Conductor concurred. The locomotive was equipped with an 8-track pulse recorder. The tape data analysis indicated that after the locomotive moved south a distance of 34 feet, the locomotive remained stopped for 17 seconds and then made another southward movement of 17 feet, over a 7-second period.

The physical evidence (position of the Switchman's body and feet) indicated the Switchman did not foul the track until after the locomotive completed its second movement (17 feet north), and that the locomotive and four cars had come to a stop. The Switchman stepped behind the fourth car (MOBX 52886), with his body located between it and the remaining 35 cars north of his position. The Switchman began adjusting the coupler on the MOBX 52886, but failed to first secure the cars north of his location with hand brakes. As the Switchman was adjusting the knuckle on MOBX 52886, a cut of unsecured cars rolled from the north and struck him, crushing his torso between the fourth and fifth cars behind the locomotive. Both the Engineer and the Conductor stated that the Switchman had not notified them before he fouled the track.

The Engineer and Conductor were taken to the yard office where carrier managers debriefed them. Blood and bodily fluids were obtained from the remains of the deceased for toxicological testing, and the results were negative. Toxicological testing was not conducted on the Engineer or Conductor.

Analysis

The incident would have been prevented had the Switchman obeyed Union Pacific rules that were applicable to his movements. He did not communicate with his crew before fouling the track; he did not separate the cars by a minimum of 50 feet; and he did not inspect the cars not coupled to the locomotive to ensure that they were secure, applying hand brakes if necessary.

APPLICABLE RULES

System Special Instructions
Effective April 2, 2000
Order Category : SYS. SI. 10-E-10-F
SYSTEM GENERAL ORDER NO. 4

Rule 81.5.4 - Understanding between crew members before fouling track. If the equipment is coupled to an occupied engine, before an employee steps foul of the track:

The employee must notify the Engineer by job briefing, agreed upon hand signal, or radio communication ("Conductor Smith to UP 1234. Going into red zone").

The Engineer must apply the locomotive or train brakes and center the reverse, then notify the employee by job briefing, agreed upon hand signal, or radio communication i.e.; (" UP 1234 to Conductor Smith, I understand, I am set and centered").

If going between cars, the employee must inspect cars not coupled to the locomotive to ensure they will not move, applying hand brakes if necessary.

Union Pacific Safety Rules for all Employees

Rule 81.13.1 - Going between Cars:

> Do not go between or in front of engine or car to arrange knuckles or couplers, to manipulate other appliances, or for any other reason.

Rule 81.13.3 - Coupler Adjustment

> When necessary to make a coupler adjustment, separate equipment at least 50 feet and stop equipment.

SUMMARY FOR FE-13-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Burlington Northern Santa Fe Corporation
Location: Sedalia, Colorado
Region: 6

Month: May
Date: May 29, 2002
Time: 11:15 a.m., MST

Data for Fatally Injured Employee(s)

Rail Track Grinder Operator
36 years old
Five years of service
Last rules training: May 15, 2002
Last safety training: May 2, 2002
Last physical: Unknown

Data for All Employees (Craft, Positions, Activity)

Craft of Fatally Injured Employee and Crew: Maintenance of Way

Positions:

Crew of Work Train WDENDEN-1-29
Locomotive Engineer
Conductor
Brakeman

MOW Work Crew
Welder
Rail Track Grinder Operator

Road Master
Section Foreman
Foreman in Charge of the Ballast
BNSF Dispatcher
UP Flag Man
UP Truck Driver
UP Moffat Tunnel Subdivision Dispatcher
UP Colorado Springs Subdivision Dispatcher

SUMMARY FOR FE-13-02 CONTINUED

SELECTED FACTORS CONTINUED

UP Track Inspector
Two UP Tie Markers

Douglas County Deputy Sheriff

Activity: Track Maintenance

EVENT

A Rail Track Grinder Operator was fatally injured when struck by a freely rolling gondola car while he was maintaining track.

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

Investigators concluded the crew of Work Train WDENDEN-1-29 failed to ensure the gondola car was coupled to the work train prior to the incident. They failed to stretch the slack to ensure that all couplings were made.

PCF No. 2

Investigators concluded that the crew of Work Train WDENDEN-1-29 failed to ensure sufficient hand brake tension was applied to the gondola car when it was left on the main line. Consequently, the car's brake system lost the air required to keep tension on the brakes, and the gondola car traveled freely downgrade towards Sedalia, Colorado, striking the Rail Track Grinder Operator.

REPORT: **FE-13-2002**

RAILROAD: Burlington Northern Santa Fe Corporation (BNSF)

LOCATION: Sedalia, Colorado

DATE &TIME: May 29, 2002 ; Approximately 11:15 a.m., MST

EVENT[1]: A Rail Track Grinder Operator was fatally injured when struck by a freely rolling gondola car while he was maintaining track.

EMPLOYEE:

Craft:	Maintenance of Way (MOW)
Activity:	Track Maintenance
Occupation:	Rail Track Grinder Operator
Age:	36 years
Length of Service:	Five years
Last Rules Training:	May 15, 2002
Last Safety Training:	May 2, 2002
Last Physical:	Unknown

CIRCUMSTANCES PRIOR TO THE ACCIDENT

The crew of work train WDENDEN-1-29 went on duty at Denver, CO, at 7:50 a.m., May 29, 2002. The crew comprised a Locomotive Engineer, Conductor, and Brakeman. Prior to the fatality, the work train left Denver with an engine, EMDX 799. It proceeded south to Big Lift where it picked up one loaded gondola car, ATSF 73362. The work train then proceeded south to Castle Rock, Colorado. At Castle Rock, the Brakeman and Conductor went on the ground to perform switching moves. They were working under Track Warrant protection which covered MP 24.0 to Palmer Lake on Main Track No. 1. (It should be noted that directional traffic was used here and the majority of all traffic on Main Track No. 1 was south). The Engineer was seated in his normal position on the right side of the cab, which was on the west end of the train.

An MOW work crew, comprising a Welder and a Rail Track Grinder Operator, went on duty at Big Lift, Colorado, at 7:30 a.m. They attended a job briefing held by the local Road Master and the Section Foremen for that area. After the job briefing, the Welder and Rail Track Grinder

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[1] "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

Operator drove to Sedalia, Colorado, to work at MP 25.1 on the South Sedalia crossover frog, which is on Main Track No. 1. They were working under the protection of a Form "B", a type of exclusive track protection that gives an employee-in-charge exclusive rights on a portion of track, meaning all movements on this portion of track must be done only under his or her direction. The Form "B", which the Welder had acquired the night before from the UP Train Dispatcher, comprised limits MP 24.5 to MP 33.0 on Main Track No.1, from 9 a.m. until 3:30 p.m. Just prior to the incident, the Rail Track Grinder Operator was seated facing south, straddling the frog and grinding on it. He was wearing all his protective gear, which comprised safety toe boots, a hard hat, safety glasses, goggles, and ear plugs.

At about 10:41 a.m., the Brakeman of work train WDENDEN-1-29 at Castle Rock, MP 32.2, was instructed by the Conductor to cut off car No. ATSF 73362, leaving it on Main Track No. 1. The work train proceeded onto the back track and picked up one loaded ballast car (BN 957673), five air-dump cars (BNSF 902853, BN 964763, ATSF 186263, BNSF 902333, and BN 965243), and two empty gondola cars (BN 566073 and ATSF 74163). The Brakeman then took off the end-of-train telemetry device from car No. ATSF 73362 and stated he had applied the hand brake. The work train then proceeded out of the back track and made a shove north and onto the ATSF 73362, under the guidance of the Conductor. The work train then cut off all the cars behind BN 95763, the one car load of ballast, and proceeded south to dump the car.

The crew of the work train dumped ballast south on Main Track No. 1, through the back track switch. The train then proceeded north onto the back track, dumping onto it. The work train came to a stop and a job briefing was held with the train crew, the Foreman in charge of the ballast, and the local Road Master. While they were discussing the next move, the Road Master got a call from the Welder at Sedalia, MP 25.1. The Welder informed him that a runaway gondola car just struck and fatally injured his partner and was traveling north at a high rate of speed towards Denver.

At the time of the incident, the weather was clear. The temperature was 80^{o} F, and visibility was unrestricted.

THE ACCIDENT

At about 11:15 a.m., the Rail Track Grinder Operator was still seated facing south, straddling the frog and grinding on it. The Welder was standing about 30 feet to the north, between the rails of Main Track No. 1, evaluating the work and the next step in the restoration of the frog.

The Welder looked up just in time to see gondola car, ATSF 73362, rolling toward the Rail Track Grinder Operator. He said he didn't have time to warn him and was barely able to get out of the way. The gondola car struck the Rail Track Grinder Operator, killing him instantly and continued traveling north towards Denver. The Welder immediately called the Road Master on his cell phone and informed him of the incident. The Road Master stated he had tried to call the UP Dispatcher several times, and after failing, was able to contact the BNSF Dispatcher and inform him about the runaway car.

The car traveled north onto the UP at MP 24.9. It continued on through a construction site at Titan Road, MP 18.4, which was under the protection of a UP Flag Man. The Flag Man did not

have working time on the track, and everybody was clear. He had no knowledge of the runaway car. According to a hot box detector located at MP 18.5, the car was traveling at 58 mph.

The car proceeded north, and at approximately 11:45 a.m., at MP 13.1, it passed a UP Truck Driver who was cutting and loading pieces of rail into his truck. The rail was stationed adjacently to Main Line No. 1 and was far enough away from the track so that he did not require any type of on-track protection. He stated he was about seven to eight feet from the track and never heard or saw the car. The Truck Driver estimated the car's speed at 60 to 70 mph and indicated that the only thing he heard was the wind whistle through the car as it passed. He immediately ran to his radio and interrupted the UP Moffat Tunnel Subdivision Dispatcher who was talking to a train, and informed her about what was happening. She in turn informed the UP Colorado Springs Subdivision Dispatcher who was responsible for the movement of traffic in the area the car was traveling. The car proceeded at a high rate of speed north into Centralized Traffic Control Territory at MP 12.5.

A UP Track Inspector, who had Track and Time protection on Main Track No. 1 from Littleton to Englewood, which he had received from the BNSF Dispatcher, and a track warrant from Littleton to MP 19.2 on Main Track No. 1, which he had received from the UP Dispatcher, was inspecting north (against the flow of traffic) towards Military Junction, MP 9.2. When he arrived at Military Junction, he continued onto the yard tracks to do a monthly yard inspection. After leaving Main Track No. 1, he lined the switch back to the main. While performing his inspection, he heard the BNSF Dispatcher talking on the radio about the car. This was the first he had heard of it. The Dispatcher then called him and informed him about the car and asked if he could clear up his track and time. After he did that, he went to the UP channel and spoke with the UP Dispatcher and cleared his track warrant. At approximately 11:55 a.m., the car passed by, heading north.

A BNSF employee who was working at MP 4.3 as a Flag Man was informed of the runaway car by his Road Master and cleared the tracks. The car passed him at approximately 12:03 p.m. It continued north, and at 12:10 p.m., was recorded at a speed of 29.4 mph at MP 1.7.

Two UP Tie Markers were walking down Main Track No. 1 at MP 0.2 (20th Street). They were using Watchman/Lookout protection. They had a portable radio, and they overheard the conversations about the movements of the runaway car. They cleared the tracks and the car went by them at approximately 12:15 p.m. It continued north, and after traveling about 33 miles, it came to rest approximately 12:16 p.m., under the I-25 highway overpass in the BNSF Rennex Yard near MP 1.0, in the Front Range Subdivision.

POST-ACCIDENT INVESTIGATION

The Douglas County Deputy Sheriff arrived at the scene at approximately 11:55 a.m. and conducted an on-site investigation and interview of the victim's co-worker. At the scene, no FRA-mandatory toxicological tests were performed. However, a toxicological test was ordered on the work train crew at Castle Rock. Crew members were transported to Big Lift where the tests were performed. The deceased was tested as part of the autopsy. The results of all tests were negative.

FRA's post-accident investigation included interviews with BNSF personnel who were at the scene and the crew and personnel who were at the work train scene. Also included was an investigation by BNSF personnel, the Douglas County Sheriff's Department, and the Brotherhood of Maintenance-of-Way Employees Union.

The fatality was caused by ATSF 73362, a gondola car associated with the work train. The car, traveling under its own power (gravity) moved uncontrolled, striking the Rail Track Grinder Operator.

On June 4, 2002, BNSF performed a "Gold Shoe Test" on the ATSF 73362, which measured pressure/square inch of brake shoe against the car's wheel surface. The results of this tests were positive, with no failures or defects.

On June 4, 2002, BNSF performed a brake system and hand brake test. Included in this test was a Dynamometer Test performed by Wabtec. The test was performed at all four applied positions, and the data was recorded. The results of this test were all within the required standards with no failures.

On June 5, 2002, BNSF did a hand brake impact test using a switch engine. It impacted the car at speeds of 2 mph and 5 mph. All four measured positions of hand brake applications were impacted. No failures were recorded.

On June 11, 2002, BNSF did a car coupling mechanism test. The test was performed using every conceivable scenario of knuckle positions. Each test was performed numerous times by making a joint and stretching the cars. No failures were recorded.

FRA investigators concluded that the crew of Work Train WDENDEN-1-29 failed to insure that there was sufficient hand brake tension applied to ATSF 73362 when it was left on the main line. The crew then failed to insure that the car was coupled to the work train when they failed to stretch the train when a joint was made. When the car's brake system eventually lost the air required to keep tension on the brakes, which is normal, it traveled freely downgrade towards Sedalia, Colorado, and eventually into Denver, Colorado.

A formal investigation was performed by the BNSF at the Globeville Yard Division Office on June, 18, 2002, at 9 a.m. The defendants were the Conductor, Locomotive Engineer, and Brakeman of Work Train WDENDEN-1-29. The findings of the investigation resulted in discipline being assessed. The Conductor's employment was terminated. He was cited with violating two General Code of Operating Rules, 1.6 and 7.4. The Engineer was given a Level S, 30-Day Record Suspension. He was cited with violating two Air Brake and Train Handling Rules, 101.5.2 and 101.10.1. The Brakeman was issued a formal reprimand. He was sited with violating one Air Brake and one Train Handling Rule, 101.23.

No other discipline was administered to other employees.

APPLICABLE RULES

General Code of Operating Rules (GCOR) 1.6 "Conduct"

*****

Employees must not be:

1. Careless of the safety of themselves or others.
2. Negligent.
3. Insubordinate.
4. Dishonest.
5. Immoral.
6. Quarrelsome.
   Or
7. Discourteous.

*****

General Code of Operating Rules (GCOR) 7.4 "Precautions for Coupling or moving Car or Engines"

Before coupling to or moving cars or engines, verify that the cars or engines are properly secured and can be coupled and moved safely.

Make couplings at a speed of not more than 4 mph. Stretch the slack to ensure that all couplings are made.

*****

Air Brake & Train Handling Rules 101.5.2 "Brake Pipe Leakage Method"

The brake pipe leakage method is performed by measuring the amount of leakage in a closed system.

When to Use the Brake Pipe Leakage Method:

If the train does not meet Air Flow Meter (AFM) test conditions or is equipped with distributed power, conduct a brake pipe leakage test.

Procedures for Conducting Brake Pipe Leakage Test

1. Charge the train brake system to the appropriate pressure.
2. Wait for the signal to apply the brakes.
3. When you receive the signal, reduce brake pipe pressure by 20 psi.
4, Allow brake pipe exhaust to stop.
5, Wait 60 seconds.
6. Cut out or lap the automatic brake valve.
7. Wait 60 seconds.

8. Time the brake pipe leakage for 60 seconds.
   a. Make sure leakage does not exceed 5 psi during the 60-second test.
   b. Do not actuate during the leakage test.
9. Use the appropriate air brake test to inspect the cars.
10. When you receive the signal to release the brakes, move the automatic brake valve to the RELEASE position and cut the automatic brake valve in.

*****

Air Brake & Train Handling Rules 101.10.1 "Adding Cars not Pretested"

Conduct an air brake test if cars are added to the train when:

- The train is not at the initial terminal.
- One or more cars have not been pretested by the initial terminal air brake test (see Rule 101.6).

To Conduct the test:

1. Test brake pipe leakage with the AFM or brake pipe leakage method.
2. Make a 20 psi brake pipe reduction with the automatic brake valve.
3. Verify that the brakes apply on the rear car and cars added.
4. Place the automatic brake valve handle in RELEASE position.
5. Verify that the brakes release on the rear car and the cars added and that the brake pipe pressure is being restored at the rear of the train.

   NOTE: When performing the brake pipe leakage test, verify that the brake system is charged to at least 60 psi.

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Air Brake & Train Handling Rules 101.23 "Detached Locomotive or Cars"

When any part of a train is left standing and no train brake inspection is required, do not depend on the air brake system to secure the cars.

When detaching locomotives or locomotives and cars:

1. Make a 20 psi brake pipe reduction and wait for exhaust to cease.
2. Secure equipment against undesired movement as required.
3. Close angle cock on rear locomotive or last car to be detached from portion left standing. Leave angle cock open on portion left standing.
4. Detach the locomotive or locomotive and cars, and move at least 50 feet from the cars left standing.
5. Allow brakes on any standing portion to apply in emergency.

6. When available, use the end-of-train telemetry device to make sure that brake pipe pressure drops to 0 psi.

Do not bottle air or maintain air pressure in the brake pipe when locomotives are detached or yard air is uncoupled**.**

Exception: When separating a train in temperatures below 25° F and the train is on a grade of less than 1 percent, follow the steps in rule 101.12(B) (Inbound Train Inspection) to prevent vent valves from sticking open.

Note: After the brake pipe pressure has completely exhausted, the angle cock on the standing portion of the train my be closed to allow a locomotive to switch the cars from the opposite end.

SUMMARY FOR FE-14-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Union Pacific Railroad Company
Location: Walcot, Wyoming
Region: 8

Month: June
Date: June 5, 2002
Time: 1:29 p.m., MST

Data for Fatally Injured Employee(s)

System Laborer
43 years old
23 years of service
Last rules training: March 9, 2001
Last safety training: Oct. 2, 2001
Last physical: Oct. 30, 1993

Data for All Employees (Craft, Positions, Activity)

Craft: Maintenance of Way

Positions:

UP Distribution Gang 9091
Foreman
Assistant Foreman
Fatally injured System Laborer
Other System Laborer

Assistant Signal Foreman

Train ZRODV-05
Engineer
Conductor

Dispatcher

Activity: Marking track ties.

SUMMARY FOR FE-14-02 CONTINUED

SELECTED FACTORS CONTINUED

EVENT

A System Laborer was fatally injured when struck by a train while on an assignment to mark track ties.

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

The eastbound train struck and fatally injured the System Laborer as he was standing in the middle of the track, in non-compliance with railroad safety rules.

PCF No. 2

The investigation revealed that at the time of the incident, the gang involved was working without track and time protection. They were using individual train detection, an inadequate safety measure for their work.

PCF No. 3

Earlier in the day, after the Assistant Foreman had reviewed the two Laborers' Statement of On-Track Safety forms, he asked them to correct erroneous mile post limits. The fatally injured System Laborer failed to make the correction. By following the erroneous information, he proceeded in the wrong direction away from his gang members. Just prior to the incident, the Assistant Foreman tried to get his attention by yelling and waving his arms, but the fatally injured Laborer was too far away.

PCF No. 4

The fatally injured System Laborer's view of the oncoming eastbound train which struck him was obscured by the westbound train which was passing him just prior to the incident. In non-compliance with railroad safety rules, the Laborer was standing on an adjacent track when the westbound train passed.

PCF No. 5

The investigation revealed that the lone worker group had no portable radios with them in non-compliance with Federal regulations.

REPORT: **FE-14-2002**

RAILROAD: Union Pacific Railroad Company (UP)

LOCATION: Walcot, Wyoming

DAY & TIME: June 5, 2002; Approximately 1:29 p.m., MST

EVENT[1]: A System Laborer was fatally injured when struck by a train while on an assignment to mark track ties.

EMPLOYEE:

Craft:	Maintenance of Way (MOW)
Activity:	Marking track ties
Occupation:	System Laborer
Age:	43 years old
Length of Service:	23 years
Last Rules Training:	March 9, 2001
Last Safety Training:	Oct. 2, 2001
Last Physical:	Oct. 30, 1993

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On June 05, 2002, UP Distribution Gang 9091 started the day at the First Inn in Laramie, Wyoming. This gang comprised a Foreman, an Assistant Foreman, the fatally injured System Laborer, and another Laborer. The Foreman held a job briefing with the men at 6:50 a.m. He told them that he was informed by the railroad that they would not get the work train for the day to unload track ties as planned, so they would mark ties instead. The Foreman decided to go to Walcot, Wyoming and mark ties around mile post 658.0. He also mentioned that they were low on paint and would need more.

They discussed "Red Zones" (i.e. adequate spacing between machines and between machines and roadway workers to prevent personal injury) and talked about what type of protection they would use for the day. They talked about using either a Watchman Lookout or Individual Train Detection, and agreed they would decide which would work better when they got to the job site. They also discussed problems they were having with the gang truck. The Foreman told them that he would remain behind

[1] "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

and check on cars, do computer work, and order paint. He told them to stay close together and that there was no hurry as they were way ahead of the Tie Gang. He said that they would be under the direction of the Assistant Foreman and told them to make sure to have another job briefing when they arrived at the work location. The Foreman said that if they used Individual Train Detection when they marked ties, each man should spread out a mile apart. He told them to be sure their Statement of On-Track Safety forms were filled out and to stay alert.

Through the accident area, UP operated trains east and west over two adjacent main tracks controlled by signal indications of a centralized traffic control system, supplemented by an automatic cab signal/automatic train stop system. The two main tracks were generally about 13'6" from one another, as measured from track center to track center, and the terrain was gradually ascending toward the east. In an eastward direction, there was a sweeping left hand curve, then tangent track for approximately 3,000 feet to the point of the accident and in excess of 3,000 feet beyond. Total site distance for the crew of an eastbound train to the point of the accident was measured at 4,704 feet.

The three members of the gang proceeded out to the job site at Walco, mile post 664.0, and upon arriving at about 9:30 a.m., they had another job briefing. The Assistant Foreman held this briefing and said they would be marking ties all day. He told the laborers how they could "leap frog" around each other to get the job done easier and that the last guy would move the truck up. He said they would work 1/4 miles apart from each other and would use Individual Train Detection for their on-track safety. They would be working on Track No. 2 (the south track) and would be clear for all trains traveling on either track. They would clear on the south side of the tracks so they wouldn't have to cross over Track No. 1 (the north track).

Gang members proceeded to fill out their Statement of On-Track Safety Forms. The Assistant Signal Foreman said they were still in the truck, and he was seated in the front seat on the passenger side. The uninjured Laborer was seated to his left behind the wheel and the fatally injured Laborer was in the back seat. He had them mark the box for 70 mph train speed. He gave them the limits they would be working and asked if they understood. The Assistant Foreman said that the uninjured Laborer then gave the fatally injured Laborer his form to check, and while this was happening, he noticed a mistake in the mile posts copied. The limits should have read mile post 656.0 to 667.0, but both the fatally injured Laborer's and the uninjured Laborer's read 656.0 to 567.0. The Assistant Foreman told them the correct limits and told them to correct their copies. He said they both indicated that they would make the change.

At the time of the incident, the weather was clear, with the wind out of the west. The temperature was about 75° F, and visibility was unrestricted.

THE ACCIDENT

The gang began working at about 10 a.m. Prior to the incident, the Assistant Foreman dropped the uninjured Laborer off at mile post 696.75, then dropped the fatally injured Laborer off at mile post 660.25. He then took the truck to mile post 660.00 and got out, went to Track No. 2, and they all began marking ties walking westward. At about 1:25 p.m., all three men noticed a westbound train, Train CP ASV-03, an empty coal train, approaching on Track No. 1. The whistle on the train was

sounding continuously, and the bell was ringing. They all cleared on the south side of the tracks. The two surviving members of the gang estimated that this train passed them at about 45 mph.

At about 1:29 p.m., the westbound train had passed both the Assistant Foreman and the uninjured Laborer. The uninjured Laborer stayed off the track and was shaking up some paint while the Assistant Foreman walked back to Track No. 2 and again began marking ties, working west. The fatally injured Laborer, however, had returned to Track No. 2 before the westbound train was completely by him on Track No. 1 and proceeded to walk east to remark the ties that he had marked prior to the westbound train's arrival.

An eastbound train, Train ZRODV-05, approached the gang at a recorded speed of 55 mph and a sight distance of about 4,704 feet. As it approached mile post 660.25, the Engineer noticed a roadway worker on the track. The worker was wearing a reflectorized vest and hard hat. When the train was about 2,535 feet away, the Engineer began blowing the whistle. At about 906 feet, the Engineer realized that the worker was not going to get out of the way and put the train in emergency. At this time, the Assistant Foreman noticed that the fatally injured Laborer was on the track and was walking east with his back to the eastbound train. He began yelling and waving his arms, attempting to get his attention, but was too far away.

The eastbound train struck the fatally injured Laborer as he was standing in the middle of the track and sucked him under the cow catcher. The fatally injured Laborer was dragged under the train for 167 feet. The train proceeded about 980 feet after the impact before it came to a stop. The train crew immediately called emergency response. The victim's body was found by the Assistant Foreman, the uninjured Laborer, and the Conductor of Train ZRODV-05.

POST-ACCIDENT INVESTIGATION

Immediately after the accident, the Engineer called the Dispatcher and got a response right away. The Assistant Foreman and the uninjured Laborer responded first. They went back with the Conductor and found that the man was dead. The body was about 980 feet back from the head end of the train. Later, the medical technicians from Hanna arrived, then the Highway Patrol Lieutenant and Carbon County Sheriff, followed by the Coroner. An Operating Practices Manager (MOP) was the first UP Manager on the scene, followed by another MOP , the Director of Road Operations (DRO), and the Superintendent. They all came from Cheyenne, Wyoming. Some gang foremen were also there.

Upon the arrival at the incident scene, at about 2:29 p.m., the Carbon County Sheriff conducted an on-site investigation and interview of the victim's co-workers. At the scene, no FRA mandatory toxicological tests were performed. The deceased was later transported to the Rostad Mortuary in Rawlings, Wyoming, where an autopsy was performed the same day. Blood samples collected from the deceased were sent to the crime lab for alcohol and drug screening.

An FRA Track Inspector arrived at the scene at about 7 p.m. on the day of the accident and initiated an investigation. He interviewed the UP personnel involved at the scene for information. Later, an FRA S&TC inspector proceeding from Scottsbluff, Nebraska, joined him in the investigation. On the way to the accident scene, the S&TC Inspector contacted the UP DRO and asked him to gather available

information for the incident. At the scene, the S&TC Inspector requested that the Superintendent hold a round table meeting at his office in Cheyenne the next day for further investigation. That night an FRA OP Inspector proceeded to Cheyenne from Denver, Colorado to interview the train crew members involved. Upon his arrival at the UP Yard Office, he found that the UP personnel (correctly believing that this incident and the resultant fatality did not meet the criteria requiring FRA post-accident toxicological testing since a major category train accident was not involved), had released the train crew prior to the expiration of their hours of service. The railroad met the criteria of a "fatal train incident," rather than "major category train accident" level, and accordingly, after the railroad supervisor had investigated and determined whether the train crew had any involvement in the cause or severity of the incident, the crew was allowed to rest.

The next morning, the three FRA Inspectors all attended a meeting with the UP Officials in the Superintendent's Office in Cheyenne where they obtained and reviewed more information related to the incident. That same day, the OP Inspector interviewed the train crew members involved via the telephone.

In Omaha, Nebraska, an FRA OP Inspector contacted UP Officials and obtained information related to the incident that the FRA Inspectors were unable to obtain from the UP Field Officials. On Monday, June 11, 2002, an FRA OP Inspector interviewed the on-duty Dispatcher who was on duty at the time of the incident and obtained the "Dispatcher voice tapes." On June 20, 2002, the S&TC Inspector contacted the Carbon County Sheriff in Rawlings and UP Officials to request more information related to the incident.

The investigation revealed that at the time of the incident, the gang involved was working without a "Form B"or "Track and Time" protection. Individual Train Detection was the only form of on-track safety protection they were using while performing their duties. The employees' Statement of On-Track Safety forms showed that the uninjured Laborer made the previously mentioned necessary correction on the mile post limits, but the fatally injured Laborer never did. Field investigation also revealed that the lone worker group had no portable radios with them. The only working radio the gang had with them was in the gang truck, and it was not available or accessible to them because they were too far from the truck.

The evidence at the incident scene would indicate that the fatally injured Laborer was marking ties on the north rail of Track No. 2, walking in a westward direction prior to the arrival of the westbound train. When he returned to Track No. 2 and resumed marking ties after the head end of the train passed on Track No.1, he began marking ties on the opposite rail that he had previously marked. He had marked the ties for replacement on the north rail and eight other ties on the south rail noting "300" with yellow paint at mile post 660.30. This reflected "300" ties marked in the mile from the point he began. This is believed to be the point of impact.

FRA's investigation revealed that UP had implemented an MOW Safety Audit Program. According to UP's records, Gang 9091 was audited 123 times between January 1, 2002 and June 6, 2002. Twelve of the Audits were Comprehensive Audits where managers spent the entire day with the gang; 84 were specific observations; and 27 dealt with safety activities. The audits resulted in nine exceptions being noted by the UP Managers.

FRA's investigation also revealed that the deceased, through 23 years of service with the Union Pacific, had served as Extra-Gang Machine Operator, Track boom Operator, System Laborer, etc. At the time of his death, he was serving as a System Laborer for Gang 9091. On Thursday, May 30, 2002, he had bumped into Distribution Gang 9092, which is a system gang under the jurisdiction of Tie Gangs North. After the fatally injured Laborer joined the latest gang, he worked under the direction of the Foreman and the uninjured Laborer for the first two days when they were out on the track. This was meant to familiarize him with the area and how the gang worked. He was released on Monday, June 3, 2002, to work as a lone worker, two days prior to his death.

The post-accident toxicological tests for drug and alcohol performed on the deceased were negative.

APPLICABLE RULES

Code of Federal Regulations Section 220.11, "Requirements for Roadway Workers."

b) On and after July 1, 1999, each employee designated by the employer to provide on-track safety for a roadway work group or groups, and each lone worker, shall be provided, and where practicable, shall maintain immediate access to a working radio. When immediate access to a working radio is not available, the employee responsible for on-track safety or lone worker shall be equipped with a radio capable of monitoring transmissions from train movements in the vicinity. A radio with fewer than 400,000 annual employee work hours may provide immediate access to working wireless communications as an alternative to a working radio.

Code of Federal Regulations Section 220.11, "On-Track Safety for Lone Workers."

c) (6) Individual train detection may be used to establish on-track safety only where the ability of the lone worker to hear and see approaching trains and other on-track equipment is not impaired by background noise, lights, precipitation, fog, passing trains, or any other physical conditions.

Union Pacific Railroad Safety Rule 1.12, "Alert and Attentive", provides that:

Employees must be careful to prevent injuring themselves or others. They must be alert and attentive when performing duties and plan their work to avoid injury.

Union Pacific Railroad Safety Rule 81.1.1, "Walking on or near Track" provides that:

Do not stand or sit on, walk fouling, or walk between rails of a track unless required by assigned duties.

When standing, walking, or working between or near tracks, keep a careful lookout in both directions, for trains, locomotives, cars, or other moving equipment and expect movement at any time, on any track, in either direction. Do not rely on hearing the approach of a train or equipment.

Foremen and others in charge of employees working on or about the tracks must require the employees to be alert and watchful and to keep out of danger.

Union Pacific Railroad Safety Rule 81.1.2, "Precautions Near Passing Trains or Equipment,"provides that:

When near passing trains or equipment:

Move away from the track to avoid being struck by car doors, protruding or falling articles.

Stand clear of all tracks when trains are approaching or passing in either direction. Do not stand on one track while trains are passing on an adjacent track.

Do not allow yourself or others to be next to or between equipment while a train or equipment is closely passing on the adjacent track.

Do not rely on others to notify you of an approaching train, engine. Or other equipment unless that person's duties include providing warnings.

Union Pacific (UP) Railroad Safety Rule 136.4.3, "Individual Train Detection,"provides that:

The lone worker's ability to hear and see approaching trains and equipment is not impaired by:

- Background noise
- Lights
- Inclement weather (rain, snow, fog, etc;)
- Passing trains
  Or
- Other physical conditions.

SUMMARY FOR FE-15-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Long Island Railroad Company
Location: Malverne, New York
Region: 1

Month: June
Date: June 6, 2002
Time: 10:07 p.m., EST

Data for Fatally Injured Employee(s)

High Tension Gang Foreman
36 years old
15 years of service
Last rules training: June 6, 2002
Last safety training: June 3, 2002
Last physical: July 12, 1999

Data for All Employees (Craft, Positions, Activity)

Craft: Signal and Train Control

Positions:

High Tension Gang Foreman
Signal Inspector
Signal Inspector's Helper

Activity: Searching for a break in a downed power line

EVENT

A High Tension Gang Foreman was electrocuted and fatally injured while searching for a break in a downed power line.

SUMMARY FOR FE-15-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

Investigators determined that prior to his death, the Foreman came in contact not with the actual break in the transmission line, but with a splice in the line. While the rest of the cable was insulated, ***this splice covered a small area of the uninsulated conductor*** used by the communication field rather than the power distribution field; the two ends were soldered together. However, neither OSHA nor NYSDOL (New York State Department of Labor) required power transmission lines of this type to be insulated conductors.

PCF No. 2

The splice was not lying on the ground at the time, but was suspended by vegetation several feet above the ground. When the Foreman fell down the embankment, he slid under this section of wire, which came in contact with the Foreman and electrocuted him.

REPORT: **FE-15-2002**

RAILROAD: Long Island Railroad Company (LIRR)

LOCATION: Malverne, New York

DATE & TIME: June 6, 2002; 10:07 p.m., EST

EVENT[1]: The High Tension Gang Foreman was electrocuted and fatally injured while searching for a break in a downed power line.

EMPLOYEE:

Craft:	Signal and Train Control (S&TC)
Activity:	Searching for a break in a downed power line.
Occupation:	High Tension Gang Foreman
Age:	36
Length of Service:	15 years
Last Rules Training:	June 6, 2002
Last Safety Training:	June 3, 2002
Last Physical:	July 12, 1999

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On Thursday, June 6, 2002, an LIRR High Tension Gang Foreman was called at home by the Power Director at 8:30 p.m. His normal tour of duty was 7:30 a.m. to 3:30 p.m. The Gang Foreman was asked to investigate a reported transformer fire at Malverne. At approximately 9 p.m., the Foreman reported from Malverne that the report of the transformer fire was unfounded.

At approximately 8 p.m. on June 6, the LIRR Movement Bureau reported to the Signal Trouble Desk that all circuits had been de-energized on the West Hempstead Branch. This caused all highway-rail grade crossings on the branch to activate continuously. A Signal Inspector and his Helper were sent to investigate. The power to operate the track circuits was provided by a 440-volt, 25-hertz aerial transmission line that ran adjacent to the track. Power was supplied by the railroad's power department, and the line was maintained by the Signal Department. A Motor Generator Set was located in West Hempstead and at Valley Stream. These provided the 44-volt, 25-hertz power. The normal feed was from Valley Stream. While feeding from Valley

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Stream, all but three of the grade crossings were in the down position. When feeding from West Hempstead, all other grade crossings returned to normal, except the other three, which were now down. Both motor generators then fed the power department. This restored all circuits on the branch to normal functioning. The Signal Inspector and his Helper met up with the Foreman at the Hempstead Avenue Grade Crossing at approximately 9 p.m. They proceeded east along the right of way in search of the break in the transmission line. The Foreman and the Signal Inspector walked while the Signal Helper drove the signal truck to the Ocean Avenue grade crossing where they all met up again. They continued to proceed east, all of them now walking.

The accident occurred at night, on relatively tangent track. The power line ran along the south side of the West Hempstead Branch. The West Hempstead Branch at this location was a single main track, with an access road paralleling the track. The south side of the track structure was a steep embankment consisting largely of stone ballast, fouled to varying degrees with soil.

All that evening and at the time of the accident, it was raining heavily, with temperatures in the high 50s. The ground was very moist from the heavy rainfall; a flood watch had been issued by the National Weather Service for this area.

THE ACCIDENT

At approximately 10 p.m., the Foreman contacted the Power Director. Power Department statements indicated this contact was only to inform the Power Director that the break had been found. The Signal Inspector later stated that the Foreman had said he was going to request that the power be turned off. The Signal Inspector and his Helper proceeded to return to their truck to retrieve tools and supplies to make repairs. The Foreman remained at the location of the break. As the Signal Inspector and his Helper were returning to the location of the break, they noticed electrical arching in the area of the break and where the Foreman was located. They returned to the location to find the Foreman lying face down on the ground. The 440-volt transmission line was arcing across the back of his lower legs and on the outside of his pants.

The Signal Inspector immediately contacted the Signal Trouble Desk to request that power be removed from the 440-volt line and to request an ambulance. At Approximately 10:10 p.m., the Signal Trouble Desk received the call from the Signal Inspector and instantly relayed it to the Power Director. Power was removed from the 440-volt line at 10:11 p.m. Third rail power was also removed from the track at that location. The Transportation Department placed a block on the track. Once power had been removed, the Signal Inspector removed the transmission line from the Foreman's legs. The Foreman was unresponsive at this time. After removing power from the transmission line, the Power Director attempted to contact the Metropolitan Transportation Authority Police Department and received no response. The Nassau County Fire Command was then contacted and dispatched an ambulance to the scene. The Foreman was removed from the scene and taken to Franklin General Hospital, where he was pronounced dead at 10:50 p.m.

POST-ACCIDENT INVESTIGATION

It was determined that the Foreman came in contact not with the actual break in the transmission line, but with a splice in the line. The splice he came in contact with was known as a Western Union Splice. This splice covered a small area of the uninsulated conductor, with the two ends being soldered together. The rest of this cable was insulated. This type of splice was not used by the power distribution field, but by the communication field. The Communications Department installed and maintained all aerial cables used by the Signal Department. There were no OSHA or NYSDOL (New York State Department of Labor) requirements for a power transmission line of this type to be an insulated conductor. It should be noted that this splice was not lying on the ground at the time, but was being suspended by vegetation several feet above the ground. The Foreman fell down the embankment, and in doing so, slid under this section of wire with which he then came in contact. The non-response from the MTA PD was due to its operators already receiving the requests from both the LIRR Movement Bureau and the Signal Trouble Desk for assistance.

An autopsy was performed by the Nassau County Medical Examiners Office. In the opinion of the Medical Examiner, the Foreman died as a result of electrocution. The Medical Examiner's office reported that all toxicology tests produced negative results.

APPLICABLE RULES

A review of LIRR Electrical Operating Instructions, C.T.290, and of LIRR Corporate Safety Rules for Employees, reveals no applicable rules.

SUMMARY FOR FE-16-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Burlington Northern Santa Fe Corporation
Location: Memphis, Tennessee
Region: 3

Month: June
Date: June 16, 2002
Time: 3:15 p.m., CST

Data for Fatally Injured Employee(s)

Yard Foreman
20 years of age
One year, six months of service
Last rules training: Feb. 26, 2001
Last safety training: Feb. 26, 2001
Last physical: Jan. 15, 2001

Data for All Employees (Craft, Positions, Activity)

Craft: Transportation and Engine

Positions:

Crew of Yard Job No. 173
Engineer
Foreman
Helper

Yard Master
Utility Employee

Activity: Switching

EVENT

A Yard Foreman was fatally injured when struck by moving equipment, while conducting switching operations.

SUMMARY FOR FE-16-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

The investigation revealed that when the Foreman tried to re-couple a 54-car cut to a 23-car cut (by shoving the 54-car cut into the 23-car cut), the knuckles mismatched, a situation about which the Foreman apparently was unaware as he did not double check the coupling before his next step.

PCF No. 2

As the Foreman subsequently (and prematurely) released the hand brake on Hopper Car MLLX 105108 of the 23-car cut, he was struck by Car MLLX 10232 of the 54-car cut, and the 23-car cut rolled away 863 feet.

PCF No. 3

The Foreman was inexperienced, at 20 years of age and with only one year, six months of service.

REPORT: **FE-16-2002**

RAILROAD: Burlington Northern Santa Fe Corporation

LOCATION: Memphis, Tennessee

DATE & TIME: June 16, 2002; 3:15 p.m., CST

EVENT[1]: The Yard Foreman was fatally injured when struck by moving equipment, while conducting switching operations.

EMPLOYEE:

Craft:	Transportation and Engine (T&E)
Activity:	Switching
Occupation:	Yard Foreman
Age:	20
Length of Service:	1 year, 6 months
Last Rules Training:	Feb. 26, 2001
Last Safety Training:	Feb. 26, 2001
Last Physical:	Jan. 15, 2001

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On June 16, 2002, at 7:59 a.m., CST, after completing a statutory off-duty period, an Engineer, Foreman, and Helper went on duty at the Tennessee Yard, Memphis trimmer office. They were assigned to Yard Job No. 173 for that duty period. The crew conducted switching operations for the first part of their shift by pulling cars from the class yard and shoving them into the outbound train yard. At approximately 1:30 p.m., the crew of Job No. 173 was instructed by the Yard Master to double class Yard Tracks Nos. 33, 27, 31, 36, and 45 to make up Train H-MEMCVE1-116A. They were instructed to build the train on Track No. RD-7 and clear the crossover between Tracks Nos. RD-7 and RD-8. The crew conducted a job briefing, discussing their instructions from the Yard Master, and then proceeded to carry them out.

At approximately 3 p.m., the crew had completed building the train on Track No. RD-7. A Utility Employee was attached to the crew for the purpose of watching the South end of Track No. RD-7. After performing that duty, the Utility Employee detached from the crew of Job No. 173. The Helper on the locomotive received permission from the Engineer to go between

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equipment as required by BNSF Safety Rule S-13.1.1, Going between Cars or Locomotives Coupled to a Locomotive (a.k.a., set and centered), so that he could apply hand brakes on the north end of the cars. The Job No. 173 Foreman then walked into the trimmer office where the Yard Master asked him if he had cleared the crossover switches between Tracks Nos. RD-7 and RD-8. The Foreman stated he had not. The Yard Master then instructed the Foreman to get back with his crew and clear the RD-7 crossover switch. The Foreman radioed the Engineer and Helper and told them they needed to clear the crossover and that he would get back to them in a few minutes. The Utility Employee, who had been attached previously to the crew of Job No. 173, radioed the Foreman, and asked if he was going to need him to help clear the crossover switch. The Foreman stated to the Utility Employee that he would take care of it and would use a 4-wheel, all terrain vehicle (ATV) to ride to the crossover.

The Foreman arrived at the crossover via ATV and parked between Tracks Nos. RD-7 and RD-8. The Foreman radioed the Engineer for protection as required by carrier rule S-13.1.1, and the Engineer answered him by stating the usual phrase, "Set and Centered," which meant the locomotive reverser was centered and the brakes were in full application. The Foreman applied one hand brake on Car MLLX-105108, which was the north car of the 23 cars to be left standing south of the RD-7 crossover switch. The Foreman radioed the Engineer to release the 3-step protection. The Engineer answered him by saying, "OK, released." The Foreman then radioed the Engineer and gave instructions for the Engineer to "ease him a little slack" so he could pull the pin lever. The slack reached the car where the Foreman was located. He pulled the pin lever and instructed the Engineer to stop and pull north six or seven car lengths. The Engineer pulled north about six car lengths, and the Foreman asked how much room he had left at the north end. The Engineer answered him by saying he had about two car lengths. The Yard Master overheard the radio conversation of the Job No. 173 crew and radioed the Foreman, instructing him to re-couple and leave a couple of cars lengths so the north end could clear three locomotives. The Foreman radioed the Engineer and told him to stop the movement and shove the car south six lengths to a coupling. The Engineer stopped and then started the shove to a coupling. The Foreman gave a proper car count in car lengths to the coupling, and then the Foreman told the Engineer in a normal voice, "That's far enough; stop."

The Memphis Terminal Tennessee Yard was located between Milepost 394 and Milepost 397. The Tennessee Yard had 54 class tracks, six intermodal tracks, and 14 departure yard tracks which lay geographically north and south. There were two main tracks leading into the yard from the north and two mains leaving to the south. The Main Tracks Nos. 1 and 2 combined handled 250 to 300 million gross tons yearly. The tracks other that the main tracks were limited to restricted speed. The subject Track No. RD-7, a departure track which could hold about 110 cars, descended slightly from the north to the south for about 60 car lengths and then ascended slightly for the next 50 car lengths. The track was tangent for about 54 cars lengths from the north and then made a slight left-hand curve for about five car lengths, tangent for about 11 car lengths, and then with a slight right hand curve, and tangent for the next 40 cars. The area of the accident scene was clean without any slipping or tripping hazards.

At the time of the accident, the temperature was 94^{o} F, and the weather was clear.

THE ACCIDENT

After the Foreman had radioed to stop the movement, the Utility Employee who was previously attached to Job No. 173 observed cars rolling south on Track No. RD-7. He immediately radioed the Yard Master and asked him about the cars on Track No. RD-7. The Yard Master stated he did not know about them, but that the crew assigned to Job No. 173 was still working on the track. The Utility Employee told the Yard Master that the cars were stopping and would not go any further because of the grade in the track. The Yard Master then called the Foreman, who did not answer. The Utility Employee walked inside of the trimmer office while the Yard Master was trying to locate the Foreman with his television/security monitor. The Yard Master informed the Utility Employee he could see the Foreman lying on the ground partially under a car on Track No. RD-7. The Utility Employee then ran to his assigned ATV and traveled north on the main road along the yard tracks. When he got near the crossover at Track No. RD-7, he stopped and ran over to where he could see the Foreman lying on the ground. When he arrived, the Foreman was lying face down and had been seriously injured. The Foreman of Job No. 173 was run over by the south truck of Hopper Car, MLLX 10232, which was the south car of the 54 cars being shoved.

The Foreman was transported to the Memphis Regional Medical Center by EMS at 4:05 p.m. and later succumbed to his injuries at 6:08 p.m., CST.

POST-ACCIDENT INVESTIGATION

The crew assigned Job No. 173 had shoved 77 cars on Track No. RD-7 as the last move in building outbound Train H-MEMCVE1-116A. The crew of Job No. 173 then proceeded to make a cut between the 54th and 55th cars to clear the RD-7 crossover. The crew members were pulling north when it was observed that they were not going to clear the crossover and clear the switching lead at the north end of the yard. The Foreman had directed the Engineer, via radio transmission, to shove south six cars to a coupling, and continued directing the move in terms of car lengths to the coupling. The Foreman then directed the Engineer to stop in a normal voice tone. This was when the accident occurred.

The accident was investigated by FRA, the Memphis Area Crime Unit, and BNSF railroad supervisors. The cars and locomotives that were involved were inspected; no defects were disclosed that may have contributed to the accident. The yard locomotives were not equipped with event recorders.

A re-enactment of the accident conducted by BNSF disclosed that the same 23 cars being re-coupled to by the Foreman would stand without rolling away with just one hand brake applied. When the one hand brake was released, the same 23 cars would roll 863 feet and stop on their own. The investigation also disclosed that both knuckles at the coupling were closed. This would indicate that when the Foreman tried to re-couple the 54 cars to the 23 cars, the coupling

did not make, and the knuckles mismatched. During the re-enactment, the 54 cars were shoved into the 23 standing cars at speeds above coupling speed, which is 4 mph. With only one hand brake applied, the 23 cars would roll about 20 feet and stop.

The investigation disclosed that two boot sole prints on top of the east rail matched the boots that the Foreman was wearing at the location where the coupling was attempted. It was also noted that most of the Switchmen in the area wore the same type of safety boots. The distance from where the coupling was attempted and where the Foreman's body was found was 40 feet.

The investigation disclosed that the Foreman was found lying face down, and most of his injuries were down the back of his legs and over his head. The mismatching knuckles on the separated cars, the 23 cars having rolled away 863 feet, and the location of the bodily injuries indicated that the Foreman was struck from the back by Hopper Car MLLX 10232 while releasing the one hand brake on Hopper Car MLLX 105108. The Utility Employee observed the cars rolling on Track No. RD-7.

There were no witnesses to the accident. FRA-mandated, post-accident toxicological tests were conducted for all three crew members. The results of the tests were negative.

APPLICABLE RULES

Burlington Northern TY&E Safety Supplement No. 1 (dated Sunday October 10, 1999)

Rule S-1.1 Job Safety Briefing

Employees must participate in a job safety briefing before beginning work and when work or job conditions change. The briefing includes a discussion of the general work plan, existing or potential hazards, and ways to eliminate or protect against hazards. Outside parties or contractors involved in the work or who are in the work area must also be included in the job safety briefing.

Rule S-13.1.1 Going Between Cars or Locomotives Coupled to Locomotives (in part)

Before going between or working on the end of cars or locomotives, make sure that crew members have a clear understanding of the work to be performed.

Unless positive protection is provided, all crew members must ensure proper safeguards, as listed below, are in place.

> When the engine is coupled to the equipment which is not to be moved, the Engineer must center the reverser and fully apply the independent brakes before acknowledgment is made.

The Engineer and other crew members must ensure the equipment being secured will not move until the crew member requesting protection has either reported by radio or hand signal that he or she is no longer between or on the end of equipment.

The crew member going between or working on the end of equipment must wait until all movement of equipment has stopped and the slack has adjusted. If handbrakes are being released, take proper safeguards to ensure slack has adjusted.

SUMMARY FOR FE-17-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Norfolk Southern Corporation
Location: Bonlee, North Carolina
Region: 3

Month: July
Date: July 16, 2002
Time: 11:59 a.m., EST

Data for Fatally Injured Employee(s)

Brakeman
55 years old
34 years of service
Last rules training: Jan. 27, 2002
Last safety training: July 5, 2002
Last physical: April 16, 1998

Data for All Employees (Craft, Positions, Activity)

Craft: Transportation and Engine

Positions:

Switching Crew
Engineer
Conductor
Brakeman
Conductor Trainee

Pomona Yard Car Inspectors
General Yard Master
Greenville Dispatcher

Activity: Switching

EVENT

A Brakeman was fatally injured when crushed between a locomotive he was riding (holding the hand rail) and a standing rail car.

SUMMARY FOR FE-17-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

The crew members did not use proper radio procedures. They made the following series of errors: The Brakeman attempted to use the locomotive radio to communicate with Engineer, but this caused a squealing feedback from the radios of the Conductor and Trainee. Consequently, they all turned off their portable radios. The Brakeman then gave instructions to the Engineer for movements via the locomotive radio; the Engineer did not acknowledge the communications, but seemed to make the correct movements. This was in violation of the railroad operating rules and Federal regulations which state that when instructions are not acknowledged or understood, the movement shall be stopped immediately, and may not be resumed until the misunderstanding has been resolved, radio contact has been restored, or communication achieved by hand signals or other procedures in place.

Subsequently, upon approaching the standing cut of cars (with the Brakeman on the hand rail), the Brakeman called a slow order to the Engineer. The Engineer later denied hearing the communication. The Brakeman started to exit the locomotive when the Conductor looked up and saw they were approximately one and one half car lengths from the standing cars. Because he could not hear the Brakeman on his radio, he attempted to use his portable radio, forgetting it was turned off, to notify the Engineer, saying "That'll do." The collision then occurred.

PCF No. 2

In non-compliance with the railroad's general regulations, crew members did not give undivided attention to their duty and were distracted at critical times during the switching activity. Just prior to the fatal collision, the Conductor and Trainee were having a private conversation and did not look out for the Brakeman who had told them he was going out to make the coupling on the train, as he started to exit the locomotive. The Conductor also was getting his paperwork together and looking down at the console desk.

PCF No. 3

Had the crew decided to swap ends prior to beginning the reverse move of the lite engine, communication between the Locomotive Engineer and other crew members would not have been necessary.

REPORT: **FE-17-2002**

RAILROAD: Norfolk Southern Corporation (NS)

LOCATION: Bonlee, North Carolina

DATE & TIME: July 16, 2002; 11:59 a.m., EST

EVENT[1]: A Brakeman was fatally injured when crushed between the locomotive he was riding (holding onto the hand rail) and a standing rail car.

EMPLOYEE:	Craft:	Transportation and Engine (T&E)
	Activity:	Switching
	Occupation:	Brakeman
	Age:	55 years
	Length of Service:	34 years
	Last Rules Training:	Jan. 27, 2002
	Last Safety Training:	July 5, 2002
	Last Physical Examination:	April 16, 1998

CIRCUMSTANCES PRIOR TO ACCIDENT

On July 16, 2002, at 6 a.m., a 3-person train crew, comprising an Engineer, Conductor, and Brakeman reported for duty for their regular assignment (Train number E12P7) at the Pomona Yard Office, milepost CF69.3, in Greensboro, North Carolina. A Conductor Trainee also reported to work for her second day on the job assignment. Prior to reporting for duty, all crew members including the Trainee received 13 hours and 30 minutes off duty, exceeding the statutory off-duty requirements.

While at Pomona Yard, the crew held a short and general job briefing concerning their work assignments and the bulletins issued. The Conductor, Brakeman, and Trainee discussed their anticipated switching moves with each other as the Engineer listened. During their job briefing, they discussed the unusual number of cars in their train. Train No. E12P7 comprised 108 loads for this trip. They normally handled approximately 50 to 60 rail cars. The crew members determined it would be difficult to start their train from a complete stop with trailing tonnage of 14,183 tons, at the ascending grade of 1.37 percent for four tenths of a mile, beginning at milepost CF110.3. It was decided that all but the six head cars in their train, for delivery to Gold Kist Industries, would be left at milepost CF109.0, a location approximately 410 feet west of the Mt. Vernon highway-rail grade crossing at milepost CF109.1. The Brakeman would ride the rear locomotive of their 4-locomotive consist from Pomona Yard to milepost CF109.0, a distance of approximately 39 miles.

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[1] "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

The Trainee did not understand the moves to be made at Gold Kist Industries, at milepost CF110.3, and asked the Conductor to explain the moves again, which he did. The Trainee stated she did not understand the moves and did not ask for further explanation. The job briefing made no mention of the details of the Mt. Vernon grade crossing move, i.e. use of hand signals or radio communications, the number of hand brakes required to hold their train on the grade, and how the move would be protected upon returning to their train from Gold Kist Industries.

At 6:41 a.m., the Engineer and Brakeman doubled their train at Pomona Yard and received an initial terminal air brake test by the Pomona Yard Car Inspectors. At 7:37 a.m. the Brakeman received and copied a track warrant authorizing movement from Greensboro, east to milepost CF 102. At 8 a.m., the General Yard Master transported the Brakeman and the remainder of the crew to the head end of the train located at the Wye track at milepost CF69.0. The General Yard Master conducted an additional job briefing concerning the switching operations at Gold Kist Industries.

The "CF" Line segment extended from Pomona Yard at Greensboro, North Carolina to milepost CF130.0 at Sanford, North Carolina. The method of operation for this line segment was Track Warrant Control (TWC) and was non-signaled. Train No. E12P7 departed eastward at 8:05 a.m., July 16, 2002.

At 10:17 a.m., Train number E12P7 stopped at milepost CF100.5 to receive another track warrant. At 10:21 a.m., the Conductor received a track warrant authorizing movement from milepost CF102.0 to milepost CF114.0, and Train No. E12P7 proceeded east. At about 11:05 a.m., Train No. E12P7 stopped at milepost CF109.0 where the Brakeman secured their train and cut off the four locomotives and six head cars. They then proceeded east to Gold Kist Industries at milepost CF110.3. Upon arrival at Gold Kist Industries, they pulled five empties and spotted the six loads. At 11:40 a.m., they shoved their five empties to the Bonlee Passing Track also at milepost CF110.3. The Brakeman used his portable radio, tuned to Norfolk Southern Channel One, to protect the shove move and make the setoff.

At 11:45 a.m., at the Bonlee Passing track, the Trainee boarded the trailing locomotive NS 9264, short hood facing west, while the Engineer was located on the east end of the 4-lite-locomotive consist on NS 8211, short hood facing east. The lite locomotives were coupled as in a push-pull configuration with locomotives NS 8211, NS 9490, NS 8774 and NS 9264. The Conductor transmitted from outside the locomotive cab, via portable radio, to the Engineer who was on locomotive NS 8211, and stated "All right, NS E12, lined through the crossover. Let's start 'em back about ten cars, ten or eleven, [the Brakeman] has got your rear back there, over." At 11:47 a.m., the Conductor transmitted from outside the cab, via portable radio, to the Engineer, saying "All right, going to need about six more to clear." Within the next minute and 15 seconds, the Conductor had counted down to one car length, and the Trainee took over radio communications from inside the cab using the locomotive radio, and said "Half, E12."

At 11:49 a.m., the Brakeman boarded the locomotive consist with the Conductor and Trainee in the cab of the rear locomotive (NS 9264). The Brakeman attempted to use the locomotive radio on NS 9264 to communicate with the Engineer. However, when he tried to transmit from the locomotive radio, it caused a squealing feedback from each of their portable radios. All three employees riding inside of the cab of the rear locomotive turned off their portable radios. This allowed communication clarity using the rear locomotive radio. The Engineer later stated that at 11:52 a.m., he heard, "Let's go back to the train," and did not acknowledge this radio transmission. According to the Conductor and Trainee, the Brakeman told the Engineer to "Come on back, we are good for 30." The Conductor and Trainee stated the Engineer did not

acknowledge this transmission, but began movement. At this point, the Brakeman was controlling the movement with the locomotive radio to their standing cut of cars located 1.3 miles away. The Brakeman was standing on the Engineer's side (north side) with his back slightly turned toward the north. He was operating the engine horn, as needed for crossing protection, and facing the other two crew members who were seated on the opposite side of the locomotive cab. The Conductor was seated in the front chair, the Trainee sitting directly behind him. The Brakeman could see forward in a westward direction when he turned his head to the right.

The movement westward began near milepost CF110.3. All crew members agreed that no other radio communication would be used until nearing milepost CF109.7, when the Conductor told the Brakeman to remind the Engineer about the permanent slow order of 20 m.p.h on the curve between milepost CF109.7 and CF109.5. The Brakeman called the slow order to the Engineer, however, the Engineer denied hearing the communication. According to the Engineer, he slowed for the curve because he could see it coming up. According to the Conductor and Trainee, the final radio communication with the Engineer was approaching milepost CF109.7.

The movement approached the grade crossing at milepost CF109.1. The Brakeman was at the locomotive console, as he was when the movement began. He was sounding the engine horn for the crossing and talking with the other two crew members simultaneously. The Trainee stated that she and the Brakeman were having a conversation with each other about their families. According to the Conductor and Trainee, the Brakeman activated the horn over the entire crossing. After the Brakeman stopped sounding the horn for the crossing, he and the Trainee continued to talk, and he (the Brakeman) began moving inside the cab of the locomotive toward the steps leading to the inside door of the locomotive. He then told the Conductor and Trainee he was going out to make the coupling on the train. While going down the steps inside the locomotive and still looking toward the Trainee, they continued their conversation. The Conductor said at that time he was getting his paperwork together and was looking down at the console desk. The Brakeman exited the inside door of the locomotive cab, closing the door behind. He apparently was in the process of positioning himself on the locomotive deck platform on the front of the short hood end of the rear locomotive.

The sky was clear; the temperature was 90^{o} F.

THE ACCIDENT

As the Brakeman exited the inside cab door of locomotive NS 9264, the Trainee looked up and saw the standing train about 80 feet away, and told the Conductor, "We are moving too fast, and I can't hear (the Brakeman) on the radio." "We're getting kind of close, ain't we." The Conductor immediately looked up and saw they were approximately one and one half car lengths from the standing cars. He attempted to use his portable radio and said, "That'll do." However, his radio was turned off. The locomotive (NS 9264) struck the standing cut-of-cars at a speed of 13 mph, as determined by the locomotive event recorder. The impact occurred at milepost CF109.03 at 11:59 a.m.

Locomotive NS 9264 struck the east car (NW 177859) of the standing cut of cars; NW 177859 was a covered hopper. The impact resulted in the locomotive coupler riding over the top of the end coupler of NW 177859, causing the engine to strike the slope sheet of NW 177859, and pinning the Brakeman between the locomotive hand rail and the locomotive body. The Conductor called the Greenville Dispatcher at 11:59 a.m, and requested help from carrier

officers and an ambulance. At 12:01 p.m., the Dispatcher called Chatham County 911. Chatham County Emergency Medical Services received the first call at 12:06 p.m. and arrived on the scene at 12:15 p.m. Chatham County's Medical Examiner pronounced the Brakeman dead at the scene.

POST-ACCIDENT INVESTIGATION

Sight distance measurements were obtained for the lite locomotives (which operate without rail cars attached) that were approaching the standing cut of cars. The sight distance was 947 feet from where the crew occupying locomotive (NS 9264) first could have seen the standing cut of cars, after coming out of a right-hand curve. Visibility from the locomotive, occupied by the Brakeman, Conductor, and Trainee, to the standing train, was not impaired by vegetation or other physical obstructions from the distance of 947 feet.

The distance from the west side of the Mt. Vernon road crossing to the lead car of the standing cut of cars was measured to be about 410 feet.

The total distance traveled by the lite locomotives without radio communication from the curve restriction at milepost CF109.7 until the impact at milepost CF109.03 was a distance of about seven tenths of a mile. There had been no radio communication from the Engineer to the rest of the crew for the distance of the reverse movement, a distance of about 1.3 miles.

All radios, including both locomotive and portable radios, were checked and found to be in good working order. The Brakeman's portable radio was retrieved from his person and was found to be on a different channel than each of the other radios, however, it could not be determined if the Brakeman's radio had been positioned on channel 4 by him or if the impact may have caused a channel change. No portable radios were turned on prior to the impact. All radio communications were required to be set to the same channel, channel 1. Locomotive event recorders were downloaded and records produced in both evaluation modes of analog-graph and digital. Locomotive brake tests for all systems were made. No defects were noted.

Postmortem toxicology tests were negative for drugs and alcohol.

APPLICABLE RULES

NORFOLK SOUTHERN CORPORATION
OPERATING RULES
Effective December 15, 1999

General Regulations

GR-6: Employees must . . . They must be alert and attentive and devote themselves exclusively to the Company's service while on duty. . . .

GR-27: Undivided attention to duty is required. While on duty, employees must not engage in any activity that will interfere with or distract their attention from their work.

Operating Rules

103: When shoving cars or engines at any location, crew members must take action to prevent damage . . .

106: The Conductor, Engineer, and pilot are jointly responsible for safety of the train and engine and for observance of the rules. Under conditions not provided for by the rules, they must take every precaution for protection. When necessary, they must instruct members of their crew as to proper performance of duties.

Other members of the crew must call the attention of the Conductor or Engineer immediately to any apparent failure to observe requirements of rules, timetable, train orders, messages, or other instructions.

When conditions require stopping the train or reducing speed and the Engineer or Conductor fails to take proper action to do so, or should the Engineer become incapacitated, other crew members must take necessary action to stop the train.

505.3: An employee who receives a transmission will repeat it to the transmitting party unless the communication (a) relates to yard switching operations; (b) is a recorded message from an automatic alarm device; or (c) is general in nature and does not contain any information or advice that could affect the safety of a railroad operation.

508: Shoving, Backing, or Pushing Movements

508.1: When radio communication is used in connection with the shoving, backing, or pushing of a train, locomotive, or on-track equipment, the employee directing the movement must give complete instructions or keep in continuous radio contact with the employees receiving the instructions.

508.2: The distance of the movement must be specified in 50-foot "car lengths" and the movement must stop in one-half the remaining distance unless additional instructions are received.

Exception: When within five car lengths of the coupling or stop, the person directing the move will call out distances in car lengths, as: "five cars," "four cars," "three cars," etc. After acknowledging "five cars," the Engineer will not be required to further acknowledge countdown if so doing would interfere with safe operation. During this countdown, the Engineer will stop the move immediately after moving one car length unless he is receiving additional signals from the person directing the move.

508.3: If the instructions are not understood or continuous radio contact is not maintained, then the movement will be stopped immediately. The movement may not be resumed until (a) the misunderstanding has been resolved, (b) radio contact has been restored, or (c) communication has been achieved by hand signals or other procedures.

CODE OF FEDERAL REGULATIONS
Part 220 - Radio Standards and Procedures
Subpart B - Radio and Wireless Communication Procedures

220.33: Receiving a radio transmission

(b) An employee who receives a transmission shall repeat it to the transmitting party unless the communication: (1) Relates to yard switching operations.

220.49: Radio communication used in shoving, backing or pushing movements

When radio communication is used in connection with the shoving, backing, or pushing of a train, locomotive, car, or on-track equipment, the employee directing the movement shall specify the distance of the movement, and the movement shall stop in one-half the remaining distance unless additional instructions are received. If the instructions are not understood, the movement shall be stopped immediately and may not be resumed until the misunderstanding has been resolved, radio contact has been restored, or communication has been achieved by hand signals or other procedures in accordance with the operating rules of the railroad.

SUMMARY OF FE-19-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Cleveland Works Railway Company
(formerly River Terminal Railway)
Location: Cleveland, Ohio
Region: 2

Month: August
Date: Aug. 8, 2002
Time: 4:15 a.m., EST

Data for All Fatally Injured Employee(s)

Conductor
53 years old
34 years of service
Last rules training: Nov. 19, 2001
Last safety training: Nov. 19, 2001
Last physical: Oct. 8, 1986

Data for All Employees (Craft, Positions, Activity)

Craft: Transportation and Engine

Positions:

Switching Crew
Locomotive Engineer
Conductor

Yard Master
Train Master

Activity: Switching

EVENT

A Conductor, who had been riding on the leading end of the lead car (gondola car), was fatally injured when crushed between the gondola car and a standing ladle car on an adjacent track as he was attempting to dismount.

SUMMARY FOR FE-19-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

According to the railroad's operating rules, the train crew should not have passed the ladle cars before stopping the movement and checking for proper clearance. The Engineer should have resumed movement only after receiving and acknowledging the Conductor's signal to do so. The train crew acted in non-compliance with the railroad's operating rules.

PCF No. 2

The Conductor used poor judgment in attempting to dismount moving equipment when it was not clear that proper clearance was available. A re-enactment revealed that the Conductor could have exited the west side of the No. 8 Track instead and benefitted from better lighting and ground conditions, thereby dismounting more easily and safely.

PCF No. 3

At 4:15 a.m., it was dark, and artificial lighting at the accident site was not adequate.

PCF No. 4

The train crew was not informed about the additional ladle cars having been placed on the track, which caused an additional clearance issue.

REPORT:	**FE-19-2002**	
RAILROAD:	Cleveland Works Railway Company (CWRO) (Formerly River Terminal Railway)	
LOCATION:	Cleveland, Ohio	
DATE & TIME:	Aug. 8, 2002; 4:15 a.m., EST	
EVENT[1]:	A Conductor, who had been riding on the leading end of the lead car (gondola car), was fatally injured when crushed between the gondola car and a standing ladle car on an adjacent track as he was attempting to dismount.	
EMPLOYEE:	Craft:	Transportation and Engine (T&E)
	Activity:	Switching
	Occupation:	Conductor
	Age:	53 years
	Length of Service:	34 years
	Last Rules Training:	Nov. 19, 2001
	Last Safety Training:	Nov. 19, 2001
	Last Physical:	Oct. 8, 1986

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On Aug. 7, 2002, at 11 p.m., a crew comprising a Locomotive Engineer and a Conductor reported for duty at the CWRO Clark Avenue Yard Office in Cleveland, Ohio. The crew had completed their statutory off-duty period. They were assigned to operate local switch Train No. 324. The primary purpose of this assignment was to service the International Steel Group (ISG) facility, also located in Cleveland, Ohio. ISG maintained an extensive internal rail service at this location, as part of the steel-making process.

The crew involved received their initial switching instructions from the CWRO Yard Master. At approximately 11:10 p.m., the train crew members proceeded to their assigned locomotive. The Engineer made the required locomotive inspection. They established radio contact and

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[1] "Event is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

performed a frequency check on both the Yard Master's channel and their assigned channel that would be used during switching operations. The Conductor entered the locomotive cab, and the Engineer operated the single locomotive with no cars to Island Yard. Here, they placed 12 cars on the scale track. After these were weighed, they switched three cars and spotted them at the Sunoco Oil facility. The crew then operated the light locomotive and coupled to 12 hopper cars loaded with coke. With the Conductor riding the lead end of the movement, the crew shoved these cars into the foundry. The Conductor walked to the first car, uncoupled the locomotive, and boarded the footboard of the locomotive. The crew members then returned to the yard office for their scheduled break.

At approximately 3:15 a.m., the crew returned to the locomotive and operated light to the scrap yard. Both crew members were riding in the locomotive cab. The Engineer was positioned at the controls of the locomotive on the west side, and the Conductor was seated in the Conductor's seat on the east side**.** At the Basic Oxygen Furnace (BOF) Plant, while operating north and toward the Scrap Yard, on Track No. 8, the crew passed a string of unattended ladle cars (the number unknown) located on Track No. 9. At the scrap yard, the crew members switched out five empty gondola cars. They returned to Island Yard, set out the empty cars, and coupled to five gondola cars loaded with scrap. The air brakes on the cars had been bled off.

As the movement passed the switch leading to the BOF, the Conductor dismounted the locomotive. Due to the curvature of the track, the Engineer could not initially see the Conductor. When the rear car was west of the switch, the Conductor radioed for the Engineer to begin shoving northward into the facility. Before the locomotive had proceeded two engine lengths, the Conductor boarded the north end of the lead car. At this time, from the position within the cab, at the controls on the west side of the locomotive, the Engineer observed the Conductor riding the north end of the lead car. He was visible from the chest up and standing approximately in the middle of the first car's lead end.

At the accident site, Track No. 9 was located to the east of Track No. 8. Both were tangent with a 12-foot, 1 1/4-inch track center and were level and equal at grade. A paved area, 12 foot in width, paralleled the west side of Track No 8. The area was illuminated by five 1,000 watt electric light fixtures which were mounted 30 feet high on the Mold Yard Building, adjacent to the paved area.

The sky was dark and clear, and the temperature was 65º F.

THE ACCIDENT

At approximately 4:15 a.m., operating in the No. 2 throttle position and at a slow speed, the lead car began to pass the unattended ladle cars standing on Track No. 9. The Engineer reduced to the No. 2 throttle position. He observed the Conductor moving toward the northeast corner of the lead rail car's end. As the lead car continued past the adjacent ladle cars, the Engineer observed the Conductor transfer to the side ladder of the lead car. It was at this time that the Engineer witnessed the Conductor beginning to roll between the upper portions of the cars and drop to the ground.

Immediately, the Engineer throttled-off, applied the full independent air brake, and radioed to the Yard Master, "Get the Train Master; we have a man down." The Engineer dismounted the locomotive and "ran" to the site, calling the Conductor's name. He responded, "I'm over here."

At approximately 4:20 a.m., the Train Master arrived and radioed to the Yard Master to "get an ambulance." The Conductor was lying on the ground between the two tracks and remained conscious. The Train Master instructed the Engineer to "go to the roadway and guide the ambulance in." Crew members from a second train were instructed to uncouple the rail cars to provide immediate access for the emergency responders.

The Cleveland Fire Department and the Cleveland Emergency Medical Squad arrived at 4:33 a.m. The initial diagnosis by the Emergency Medical Technicians was trauma due to an open pelvic area and arm injury. Dressings and a collar were applied to the Conductor. He was placed on a board and transported to Cleveland Metro Hospital. They arrived at the emergency room at 4:56 a.m. He was pronounced dead by the attending physicians at 5:32 a.m.

POST-ACCIDENT INVESTIGATION

The ladle cars used to transport molten were captive. They were neither part of the general system nor regulated by 49 CFR Part 231, Railroad Safety Appliance Standards. Job No. 234 comprised an SW locomotive and five gondolas loaded with scrap, totaling 500 tons. The estimated length was 350 feet.

On Aug. 8, 2002 at 7:40 a.m., the CWRO Mechanical Supervisor conducted an inspection of the specific ladle cars involved. There were no defects noted to the brake system, safety appliances, or general condition of the equipment. The gondola car was inspected at 7:55 a.m. There were no defects regarding the brake equipment and safety appliances. The cutting lever was found to be bent, and the over-all general condition was noted as "fair." The locomotive inspection results indicated that there were no defects regarding throttle operation, braking equipment, or safety appliances. The general condition was noted as "good."

The FRA inspection revealed that the locomotive calendar day inspection card had been completed by the Locomotive Engineer at 11 p.m. on Aug. 7, 2002. There were no defects noted. The periodic inspection and repair record was completed on June 14, 2002. No defects were noted. Carrier records indicated the gondola car was received in transfer from the Norfolk Southern Corporation on Aug. 6, 2002. The CWRO mechanical department performed an inspection. No defects were noted. On Aug. 9, 2002 , an FRA Motive Power and Equipment inspection was conducted to determine if the car was in compliance with 49 CFR Part 231.2 (hopper cars and high side gondolas with fixed ends). Inspection findings revealed that the top side and end ladder treads on the gondola were located approximately 10 ½ inches from the top of the car. The dimensions were 6 ½ inches greater than the 4 inches maximum distance required by Part 231.2(d)(2). No other defects were noted. The extreme width of the gondola car was measured at 11 feet, 2 inches. The extreme width of the ladle car was measured at 12 feet, 4 inches. These dimensions indicated that during the train movement, the clearance between the two rail cars was approximately 4 and 1/4 inches.

The Locomotive Engineer was the sole witness. Based on his statement, and under the observation of FRA investigators, the Carrier conducted a re-enactment on Aug. 20, 2002. The exact locomotive, gondola, and ladle cars were used. This disclosed that during the shoving movement, the Engineer would have been able to observe the Conductor continuously. His recollection that the Conductor had been riding on the leading end of the lead car and near the center indicated that the "B" end of the car was northward. This would place the Conductor on the brake platform and in a position to be visible to the Engineer. Had the "A" end of the car been northward, the Conductor would have been riding on the end ladder. This would have placed him on the extreme right side of the car's end, as observed by the Engineer. As the re-enacted movement proceeded past three ladle cars, the movement was stopped. At this point, the distance between the leading end of the gondola car and the ladle car was six inches or less. Due to the insufficient clearance, the Conductor was pinned between the two cars. The investigators could not determine why the Conductor had opted to dismount at this particular location, as the west side of the No. 8 Track had considerably better lighting, and the ground surface would have accommodated more easily dismounting moving equipment. It was noted that the ISG personnel had placed the ladle cars on Track No. 9, using a track mobile. With this in mind, investigators believed that the Conductor had passed only three ladle cars on the crew's prior movement to the scrap yard. The remaining two cars could have been placed by ISG personnel after this movement and prior to the second movement. There were no records to indicate their time of placement. On Aug. 8, 2002, an OSHA Investigator determined that their agency had no jurisdiction to conduct an investigation.

The Cuyahoga County Coroner's Office relied on FRA's initial report to complete its reports. The results of FRA's post-accident toxicological test for the Conductor were negative. Railroad officials had determined the Engineer did not contribute to the cause of the accident and therefore did not require that he participate in post-accident testing.

APPLICABLE RULES

The Terminal Railway Company
Revised Rules Governing Employees
Effective: October 01, 1997

General Rules

8. Employees must exercise care to avoid injury to themselves and others. They must expect movements at any time, on any track, in any direction. They must acquaint themselves with the location of structures or obstructions where clearances are close, and wear protective clothing and equipment as instructed and required. Employees who engage in unsafe practices to the jeopardy of themselves or others will be subject to discipline.

Movement of Traffic

61. When conditions require, employees must ride on moving equipment in a manner that will provide them with complete protection and place them in position to immediately give signals to other members of the crew, as necessary, and otherwise protect the movement. To protect the rear end of moving equipment that cannot be ridden, employees must walk ahead of movements to operate sirens as required to give warning that a switch is being made.

111. Before getting on or off moving equipment, face the equipment and have a secure handhold and footing, look in the direction the equipment is moving to avoid being struck by switch stands or other objects. Before getting off, look in both directions for equipment moving on adjacent tracks. Look out for ground irregularities or coal, coke, or stone, boards and other material likely to cause falling, slipping, tripping or turning an ankle. Slippery conditions underfoot call for special care.

115. Getting on moving equipment:

(b) Ride past all side obstructions.

(f) be alert for all movements on adjacent tracks.

116. Ride the side ladder on the leading end of the car when possible. Look forward and stay close to the side of the car. Be alert to the conditions in the area.

117. Maintain firm hand and foot holds to avoid falling or being dislodged in case of a sudden stop. Look forward and avoid being struck by equipment on an adjacent track or by any obstruction.

123. Watch for clearance of equipment on adjacent tracks. If in doubt about the clearance, stop the movement and check for proper clearance before giving the signal to resume movement.

124. Extreme caution must be used by employees to prevent injury to themselves or others when locomotives or cars are passing under overhead wires or structures, or where clearances are limited.

SUMMARY FOR FE-22-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: CSX Transportation, Incorporated
Location: Madisonville, Kentucky
Region: 3

Month: September
Date: Sept. 2, 2002
Time: 4:05 a.m., CST

Data for All Fatally Injured Employee(s)

Conductor
50 years old
24 years of service
Last rules training: March 13, 2002
Last safety training: March 13, 2002
Last physical: Aug. 20, 1978

Data for All Employees (Craft, Positions, Activity)

Craft: Transportation and Engine

Positions:

Train No. Q65101
Conductor
Engineer

Yard Clerk
Clerk Trainee
Dispatcher

Activity: Switching

EVENT

A Conductor was fatally injured when struck
by moving equipment during switching operations.

SUMMARY OF FE-22-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

The Conductor failed to verify whether switches were properly aligned prior to the switching movement just before the fatal collision. When he noticed the problem, he crossed in front of the movement to properly align the switch and was struck by the equipment.

PCF No. 2

The Conductor did not comply with the railroad's operating rules requiring him to be alert and keep clear of the movement of cars, and to look in both directions before crossing or fouling a track.

PCF No. 3

After instructing the Engineer to commence a shoving movement, the Conductor stepped in front of the moving equipment. He failed to inform the Engineer first and request "3-step protection," as required by railroad operating rules. This protection includes the Engineer applying the train's air brakes, the Engineer placing the throttle in the neutral position, and the Engineer closing the diesel fuel feed line.

REPORT:	**FE-22-2002**	
RAILROAD:	CSX Transportation, Incorporated	
LOCATION:	Madisonville, Kentucky	
DATE & TIME:	Sept. 2, 2002; 4:05 a.m., CST	
EVENT[1]:	The Conductor was fatally injured when struck by moving equipment during switching operations.	
EMPLOYEE:	Craft:	Transportation and Engine (T&E)
	Activity:	Switching
	Occupation:	Conductor
	Age:	50 years
	Length of Service:	24 years
	Last Rules Training:	March 13, 2002
	Last Safety Training:	March 13, 2002
	Last Physical:	Aug. 20, 1978

CIRCUMSTANCES PRIOR TO THE ACCIDENT

The home terminal for the employee was Evansville, Indiana. He reported for duty at 6:30 a.m. on Sept. 1, 2002 as the Conductor of Train No. Q65101 operating from Evansville to Nashville, Tennessee. He and the Engineer experienced an uneventful trip from Evansville to Nashville. They were released to take rest in Nashville at 2:30 p.m. on Sept. 1, 2002. Information available to the crew members indicated that they would probably be called to return to duty immediately upon expiration of their statutory rest periods following this trip. The Conductor and the Engineer went to a local restaurant for a meal and returned to the motel to begin their rest period. They were called at 8:39 p.m. and instructed to return to duty at 10:30 p.m. to operate Train No. Q59602 from Nashville to Evansville. The crew members reported as instructed, performed the normal initial terminal duties, and departed Nashville at 11:55 p.m. bound for Evansville.

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[1] "Event is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

Their 5,045-foot, 3,463-ton train comprised 10 loads and 68 empties. The crew members experienced an uneventful trip, arriving at Madisonville, Kentucky at 3:04 a.m. on Sept. 2, 2002.

The accident occurred on the north switching lead of the Madisonville Atkinson Yard. The yard in the vicinity of the accident was well lighted and level with no obvious hazards such as ditches, holes, or other obstacles to walking such as scrap rail or crossties. There had been no rain for some time, and the area was dry. The switches were marked with numbers to eliminate confusion involving track numbers. There were no structures in the immediate vicinity of the track. Tracks in this location were oriented in a north-south direction. At the north end of the yard there were four tracks as follows from east to west: the cut-off main, power siding, No. 1 extension, and Earlington Main. There was a crossover from the power siding to the No. 1 extension and a facing point movement southbound from the power siding to the extension. South of the extension end of the crossover was the switching lead. Tracks originating from the switching lead included Nos. 1, 2, 4, 6, and 8. Tracks Nos. 3, 5, 7, and 9 branched off from Tracks Nos. 2, 4, 6, and 8, respectively, approximately two car lengths from the lead switches.

At the time of the accident, the sky was dark and clear, and the temperature was 72º F.

THE ACCIDENT

The crew members had stopped their train at the yard office after arriving at Madisonville. They remained at the yard office from approximately 3:10 a.m. until about 3:40 a.m. During this time, they had used the computer to determine the location of opposing trains and talked to the Yard Clerk and a new Clerk Trainee about various subjects, including what tracks were available to make their 7-car set in the north end of the yard. The Engineer had performed a walk-around inspection of the locomotives at this time, while the Conductor was in the yard office talking with the Clerk and Clerk Trainee. The Conductor and Engineer departed the yard office and conducted a job briefing concerning what was to be done about the set off in the north end of the yard. There were five locomotives on the train, two of which were on line; the seven rail cars immediately behind the locomotives were to be set off at Madisonville on Tracks Nos. 1, 4, or 8. The Clerk had informed the Conductor that these tracks should be clear and that the only problem with using any of them was that Track No. 1 might still be spiked and tagged with a maintenance-of-way tag as being out of service due to some track work which may not have been completed. As they were headed north, the Engineer was on the right (east) side of the movement, and the Conductor was on the left (west) side, next to the yard tracks. They were headed north through the yard on the power siding track.

When they reached the north end, the Conductor dismounted the locomotive on the west side. He separated the train behind the seventh rail car and instructed the Engineer to pull northward to clear the crossover to the switching lead. The Conductor was controlling the movement by radio communication. He instructed the Engineer to stop after clearing the north crossover switch.

The No. 1 yard track switch was spiked and tagged as out of service by maintenance-of-way forces. The Conductor then operated both crossover switches to line the movement onto the No. 4 yard track. At this time, crew members of another northbound train on the Earlington Main Track, which was passing on the west side of the yard, observed the Conductor as he was operating these crossover switches. After operating these switches, the Conductor contacted the Engineer and instructed him that the switches were lined onto Track No. 4. He indicated that he was clear of the track, and instructed the Engineer to shove onto Track No. 4.

The Engineer then commenced a southbound movement. The maximum authorized speed was 10 mph and the event recording tapes indicated that the Engineer had reached a top speed of 9 mph. The Engineer indicated that he had shoved what he considered an appropriate distance of about 10 or 12 car lengths when he attempted to contact the Conductor by asking him how it looked back there. He received no answer and he began to slow down. He had slowed to 3 mph when he impacted the rail cars which were already on Track No. 3.

The Engineer continued to attempt contact with the Conductor. When he received no response, he contacted the Dispatcher, informed him of the circumstances, and told the Dispatcher that he was going back to look for the Conductor and inspect the train. The Engineer indicated that he thought the movement might have derailed due to the coupling which felt hard to him. He dismounted on the west side and walked back to the coupling on Track No. 3 where he found nothing wrong. The Engineer then crossed over to the east side and walked back toward the locomotives. He indicated that he had walked only a few cars, maybe three or four, when he saw a severed leg beside the track. He then ran back to the locomotive looking for the Conductor but did not see him. He called the Dispatcher and notified him of the emergency.

Emergency personnel from the Regional Medical Center, which was only about 200 to 300 yards from the railroad at this location, responded to the scene. The torso of the fatally injured employee was found beneath the locomotives on the switching lead. The Kentucky State Police responded and treated the situation as a crime scene until evidence was developed indicating that the fatality was accidental. The Conductor was pronounced dead at the scene of the accident by the Hopkins County Coroner.

POST-ACCIDENT INVESTIGATION

Findings of the post-accident investigation indicated that the train movement had actually been lined onto Track No. 3 instead of Track No. 4. However, evidence indicated that the employee was struck on the lead before the movement had entered any storage tracks. The Conductor had been struck by the equipment approximately six or seven car lengths after the southbound movement had been started.

The movement, which continued onto Track No.3, struck the equipment standing on Track No. 3. The total distance moved was approximately 16 car lengths. The last crew to use the

north end switching lead indicated that they had made their last move on Track No. 3 and that lead switches should have been lined for Track No. 3.

The fatally injured employee had worked the Henderson subdivision for almost four years and had actually worked this job assignment, which normally carried a set off for Madisonville Yard, 13 times during 2002. The Engineer said he did not notice any abnormal behavior on the part of the Conductor during the trip to Nashville or on the return trip up to the time of the accident. None of their discussions had indicated that the Conductor was preoccupied with any personal problems or had anything on his mind that would divert his attention unnecessarily. The Engineer indicated that he appeared alert and attentive to duty each time he had observed him. They had just spent about 30 or 45 minutes in the yard office prior to going to the north end of the yard. They were in no hurry, and he could not conceive why the Conductor would place himself in such a position.

Prior to accepting the call for Train Q65101 from Evansville to Nashville, the Conductor had been off since August 29, at 1:10 p.m. He had been subjected to 37 efficiency tests during the previous 12 months with four failures for Rules 2201, 2004, SA-SP7, and 55, none of which were relevant to the incident. He also had been tested on 103/104 rules and radio rules a number of times and found to be in compliance.

The injury, accident, and discipline history of the Conductor and the Engineer were furnished by the railroad. The Conductor received four personal injuries and was involved in three accidents. The Engineer received no personal injuries and was involved in one accident. No discipline history was recorded in the data base for either employee. None of the accidents involving the Conductor or Engineer was human factor-related.

FRA's mandated, post-accident toxicological tests were negative for both the Engineer and the Conductor.

The post-mortem examination report completed by the Kentucky State Medical Examiner's Office indicated that the fatally injured employee died of "massive blunt crush injury."

The investigators examined several theories as to what had occurred, including the Conductor's position on the east or west side of the movement prior to the incident and why he would have attempted to cross in front of moving equipment. The last people known to have seen him alive were the crew members of the northbound train passing him on the Earlington Main Track as he aligned the crossover switches from the power siding to the switching lead. They placed him on the west side of the switching lead at the south end of the crossover as they passed. Subsequently, he had informed the Engineer via radio communication that the switches were lined onto Track No. 4 and he was clear of the track, and had instructed the Engineer to shove to the clear on No. 4. The explanation which seemed the most plausible to the investigators was that the Conductor was on the east side of the switching lead after his radio communication to the Engineer. If he was on the west side, he would not have had to cross in front of the equipment to align the number 2/3 lead switch, which was improperly aligned. He had placed

himself on the east side for his own convenience to be in position to operate the angle cock between the locomotive and lead car after the shoving movement was complete without having to lean over the draw bar between the lead car and locomotive. He then started walking southward along the east side of the lead to be in position at the clearance point of Track No. 4 where he would make the separation between the locomotives and rail cars. As he was making his way southward, he noted that he had mistaken the 2/3 lead switch for the 3/4 lead switch, and the movement he was controlling was not properly aligned onto Track No. 4, as he had told the Engineer. Then, without taking note of the proximity of the approaching movement on the switching lead, he crossed in front of the movement to properly align the switch. The equipment struck him approximately 25 feet north of the 2/3 lead switch as he was crossing the lead. Seven rail cars and two locomotives of the movement passed over him resulting in massive and fatal trauma.

APPLICABLE RULES

There are a number of rules which apply to this situation. The first is CSX Transportation, Inc.'s Operating Rule 104-C which states that "employees lining switches must ascertain that the route is lined for the movement." The reason for including this rule is that the improperly aligned switch distracted the Conductor and therefore contributed to the ultimate outcome. CSX's Transportation Safety Rule 2051 requires employees working on or about tracks to be alert and keep clear of the movement of cars, and to look in both directions before crossing or fouling a track. Safety Rule 2052 requires employees crossing tracks to take the shortest route and secure "3-step protection" in accordance with Rule 2053A (concerning safe passage around and between rail cars) if crossing the track within 25 feet of the end of the equipment with a locomotive attached. Three-step protection requirements include the following: The Engineer applies the train's air brakes; the Engineer places the throttle in the neutral position; and the Engineer closes the diesel fuel feed line before a member of the train crew enters the red or danger zone. (Since the Conductor did not notify the Engineer before moving in front of moving equipment and requesting such protection, the Engineer did not provide it.)

Radio rules were not considered relevant to this incident. The Conductor had informed the Engineer that he was in the clear, and that he was aligned onto Track No. 4. The job briefing which the Conductor and Engineer had conducted on the way to the north end of the yard provided information that Tracks Nos. 1, 4, and 8 were clear. The Engineer was throughly familiar with the area and knew the distances involved. Also, the distance covered from the initiation of the southbound movement to the impact with the Conductor was approximately six rail car lengths, and the distance visible from the initiation of the movement to the clearance point of Track No. 4 was approximately 12 car lengths. The Engineer indicated that he shoved what he considered an appropriate distance, 10 or 12 car lengths, and then attempted to contact the Conductor for further information. When contact with the Conductor could not be established, he began slowing down in preparation to stop.

SUMMARY FOR FE-23-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Burlington Northern Santa Fe Corporation
Location: Yutan, Nebraska (near Fremont, Nebraska)
Region: 6

Month: September
Date: Sept. 18, 2002
Time: 7:50 a.m., CST

Data for All Fatally Injured Employee(s)

Conductor
52 years old
33 years of service
Last rules training: March 2, 2001
Last safety training: Unknown
Last physical: Unknown

Data for All Employees (Craft, Positions, Activity)

Craft: Transportation and Engine

Positions:

Train R-NEB 4251-18A
Engineer
Conductor
Brakeman

Dispatcher

Activity: Switching in Fremont, then traveling in two lite locomotives to Yutan

EVENT

A Conductor fell from the front of the locomotive he was riding
and was fatally injured as the locomotive ran over him.

SUMMARY FOR FE-23-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

The Conductor, ***out of the Engineer's line of sight and without first informing him***, proceeded from the Fireman's side of the lead locomotive, through the front door, to scare a dog away from the train. He then fell from the Fireman's side of the front platform of the locomotive, suffering massive head trauma as both lite locomotives ran over him.

REPORT:	**FE-23-2002**	
RAILROAD:	Burlington Northern Santa Fe Corporation (BNSF)	
LOCATION:	Yutan, Nebraska (near Fremont, Nebraska)	
DATE & TIME:	Sept. 18, 2002; 7:50 a.m., CST	
EVENT[1]:	The Conductor fell from the front of the locomotive he was riding and was fatally injured as the locomotive ran over him.	
EMPLOYEE:	Craft:	Transportation and Engine (T&E)
	Activity:	Switching in Fremont, then traveling in two lite locomotives to Yutan.
	Occupation:	Conductor
	Age:	52 years
	Length of Service:	33 years
	Last Rules Training:	March 2, 2001
	Last Safety Training:	Unknown
	Last Physical:	Unknown

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On September 18, 2002, after having had 12 hours off-duty, a train crew comprising an Engineer, Conductor, and Brakeman reported for duty at 6 a.m., CST at Fremont, Nebraska, to operate Train R-NEB 4251-18A, a local train working out of Fremont.

The crew received a job briefing prior to beginning any work. They were to be working with Locomotives Nos. BNSF 2106 and BNSF 2722. The crew picked up three cars and a weigh car off the storage track in Fremont and performed the air test on the cars. The crew then proceeded to the north end of town where a train had left some cars the night before, cut off the cars they had been pulling, and went into the siding and coupled to the cars to be picked up. They then

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[1] "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

performed the required air brake test and proceeded back to the cars on the main line. The Brakeman then got on the rear car, and the train shoved back into Fremont. They went across Main Street and cut off the weigh car; the Conductor was at the switch.

The crew kicked a cut of cars which included the weigh car onto the Freezer Track and went back to the other cars. The Conductor then went into the Yard Office to get the necessary track warrant so their train could proceed to Yuton, approximately 15 miles timetable direction eastward from Fremont**.** While the Conductor was in the yard office, the Engineer and Brakeman took the remaining cars and shoved them onto the House Track. As the Conductor returned from the yard office, the Brakeman lined the switch and the Conductor got into the lead locomotive. The Brakeman then got into the cab of the second locomotive, and the crew members proceeded with their two locomotives lite toward Yuton. They were operating with the BNSF 2106 in the lead with it's short hood forward.

The train crew members had a non-eventful trip the nearly 15 miles to Yuton. As they neared Yuton, at about milepost 16, the Engineer started to blow the horn because he noticed a dog running beside the train on the right side of the track. He stopped the train momentarily and then proceeded on eastward slowly, gaining up to a speed of 17 mph.

The sky was cloudy, and the temperature was 65^{o} F.

THE ACCIDENT

At approximately 7:50 a.m., the Conductor proceeded from the Fireman's side of the lead locomotive, through the front door, to scare the dog away from the train. The Engineer could not see the Conductor, who apparently fell from the Fireman's side of the front platform of the locomotive, while attempting to scare the dog away. Subsequently, both locomotives ran over him.

The Brakeman was still in the trailing locomotive looking out the window. He then moved to the right side to look out the window and see whatever had caused the Engineer to blow the train whistle and slow down. He then saw something between the tracks and did a double-take, as it looked like the Conductor. The Brakeman immediately hollered at the Engineer via radio and told him that it was the Conductor between the tracks. The Brakeman received no response from the Engineer, but the train came to a stop. The Brakeman looked to see if the Engineer was in his seat, and he was not. The Brakeman then looked out the left window and saw the Engineer running towards the Conductor. The Brakeman then disembarked the trailing locomotive to join the Engineer on the ground.

Upon discovering the Conductor's remains between the rails, the Engineer and Brakeman then ran back to the lead locomotive, and the Engineer called the Dispatcher on 911. When the Dispatcher responded, the Engineer was unable to talk. The Brakeman told the Dispatcher they needed emergency medical personnel and gave the Dispatcher the train's location.

The Saunders County Sheriff's Department was notified at 7:58 a.m. Two investigators from the Sheriff's Department arrived at the scene at 8:10 a.m., and the Chief Deputy arrived at 8:20 a.m. The Saunders County Coroner and Yutan EMS personnel were also notified and responded to the scene. The Conductor was pronounced dead at the scene by the Saunders County Coroner at 9:25 a.m. The cause of death was determined to be massive head trauma from being crushed by the locomotive**.** The BNSF did not request an autopsy.

The body was transported from the scene to the Reichmuth Funeral Home Elkhorn Chapel in Elkhorn, Nebraska, where post-accident toxicological testing took place. The Engineer and Brakeman were transported to Saunders County Hospital in Wahoo, Nebraska, for post-accident toxicological testing.

POST-ACCIDENT INVESTIGATION

An Operating Practices Inspector from the Federal Railroad Administration (FRA) responded to the accident scene for investigation. He inspected the locomotives and the accident area and took no exceptions to any conditions found. He also spoke with BNSF Officials regarding this incident and obtained copies of associated documents from FRA's Drug and Alcohol Program Manager.

With no eye witnesses, no undisputable explanation could be found that determined exactly how or why the victim fell from the locomotive. Post-accident toxicological testing was conducted on all members of the crew. Results of the tests conducted under FRA's post-accident procedures on the Engineer, Conductor, and Brakeman were reported negative**.**

APPLICABLE RULES

No violation of Federal laws, regulations, or rules were applicable to this employee's death.

SUMMARY OF FE-24-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Illinois Central Railroad, a subsidiary of Canadian National Railroad
Location: Stevens Point, Wisconsin
Region: 4

Month: September
Date: Sept. 19, 2002
Time: 10:55 a.m., CST

Data for All Fatally Injured Employee(s)

Carman
44 years old
12 years of service
Last rules training: Jan. 15, 2002
Last safety training: July 27, 2002
Last physical: Unknown

Data for All Employees (Craft, Positions, Activity)

Craft: Maintenance of Equipment

Positions:

Repair Job: Freight Car No. CN 56034
Carman A (fatally injured)
Carman B (seriously injured)

Working on Adjacent Track
Carman

Activity: Repairing a freight car's defective cylinder

EVENT

A Carman was fatally injured by an explosion while trying to repair a freight car's defective cylinder.

SUMMARY OF FE-24-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

Just prior to the incident, the fatally injured Carman was leaning over the freight car's defective cylinder, holding a pair of pliers with the nut, while the seriously injured Carman was attempting to weld the nut in place. Investigators concluded that prior to the explosion, one of the Carman had cleaned the piston head with Penray Gum-solve, a highly flammable substance. The welding process provided the source of ignition necessary to cause the fatal explosion.

The investigators' conclusions were supported by testing all rags in the area, the two Carmen's clothing, and the cylinder for levels of substances such as Acetone, Toluene, and Xylene found in Gum-solve. Levels were very high.

Note

As a result of the post-accident investigation's findings, CN implemented a policy requiring that all defective air side dump cars with air cylinders were to be repaired by a private contractor in Winnipeg, Canada.

REPORT:	**FE-24-2002**	
RAILROAD:	Illinois Central Railroad (IC), a subsidiary of Canadian National Railroad (CN)	
LOCATION:	Stevens Point, Wisconsin	
DATE & TIME:	Sept. 19, 2002; 10:55 a.m., CST	
EVENT[1]:	The Carman was fatally injured by an explosion while trying to repair a freight car's defective cylinder.	
EMPLOYEE:	Craft:	Maintenance of Equipment (MOE)
	Activity:	Repairing car
	Occupation:	Carman
	Age:	44 years old
	Length of Service:	12 years
	Last Rules Training:	Jan. 15, 2002
	Last Safety Training:	July 27, 2002
	Last Physical:	Unknown

CIRCUMSTANCES PRIOR TO THE ACCIDENT

For the purpose of identification in this report, Carman A was fatally injured, and Carman B was seriously injured.

On Sept. 19, 2002, two Carmen reported for duty at approximately 6:30 a.m. to the Canadian National Railroad's car shop in Stevens Point, Wisconsin in CN's Wisconsin Central Division. The two Carmen were assigned to work on Track No. 5 in the car shop. Their shift began at 7 a.m., at which time a 10-minute safety briefing was conducted with the reading of the safety rule of the day**.** The two Carmen then went to work.

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[1] "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

The sky was cloudy, and the temperature was 55° F.

THE ACCIDENT

After repairing a couple of freight cars, the Carmen spotted Freight Car No. CN 56034 for repair. It was an air-actuated, side dump car used by the MOW Department to haul and dump ballast along the railroad right-of-way. Because the car was loaded, one of the air dump cylinders had to be removed from the car to repair the broken bolts in the small cylinder head. Carman B removed the bolts that secured the air dump cylinder to the car. Carman A returned with the fork lift. The cylinder was placed on the fork lift, then on the fork of the fork truck, and moved to a location between Tracks Nos. 4 and 5 inside the car shop.

The Carmen placed the cylinder on blocks to avoid damage to the air pipe on its bottom. They discovered that of the four bolts that attached the small cylinder head to the car, three were broken and one was missing. The two Carmen were attempting to weld a nut to the broken portion of one of the three broken bolts. This was their second attempt to weld the nut on the broken bolt, as the nut had come off the broken bolt on their first attempt. They used this procedure so a wrench could be used to back out the broken bolt.

Carman A was leaning over the cylinder holding a pair of pliers with the nut, and Carman B was attempting to weld the nut in place. As Carman B started to weld the nut, an explosion occurred within the cylinder, causing the large portion of the 2-stage cylinder to extend upward at a rapid pace. Carman A was struck in the upper chest and head with the large portion of the cylinder. The impact threw him against freight car CN 56034; he bounced off of the car and came to rest between Tracks Nos. 4 and 5 beside a building support beam and large floor fan. Carman B was struck in the face and was found hunched over near the west truck on CN 56034 with facial bleeding**.** The first responder to the accident scene was the Stevens Point Police, followed shortly by the Stevens Point Fire Department EMT Team. Carman A was transported to Saint Michael's Hospital where he was pronounced dead at 11:15 a.m. by the Portage County Coroner.

POST-ACCIDENT INVESTIGATION

The car was bad-ordered for a broken connection lug assembly on the top of one of the pistons used to tilt the car to dump the load. CN 56034 was equipped with four 2-stage, air dump cylinders, two on each side near the ends of the car. The 2-stage air dump cylinders comprised a housing approximately 39 inches tall by 32 inches in diameter. Inside the cylinder were two pistons, one large piston 26 inches in diameter, and a smaller piston 5 ½ inches in diameter. As air pressure was introduced into the cylinder housing, the larger piston deployed first to a height of two feet. Then the smaller piston deployed also to a height of two feet, to complete the dumping cycle of the car. The connection lug that attached the cylinder to the side of the car sat on top of the small piston and was held in place by four ½-inch by 2-inch bolts. On this particular cylinder, three of the four retaining bolts were broken and the fourth bolt was missing.

According to statements of employees in the vicinity, the first attempt at welding on the broken bolt failed, so the two Carmen attempted to re-weld another bolt or nut to the broken portion. At this time, an explosion occurred. According to the other employees in the area, the explosion sounded like a shotgun blast, and one employee working on the next track thought that a freight car had fallen off its jacks.

During an investigation of the accident site, investigators found an aerosol spray can of carburetor and fuel injector cleaner on the brake step of the side dump car. On September 25, FRA viewed the air cylinder and accident site. Close examination of the connection lug cap revealed an accumulation of grease and oil on the bottom side that attached to the small piston head. They examined the top of the small piston which was found to be completely grease and oil free. This indicated the piston head had been wiped clean with rags and some sort of solvent.

During the interviews, a Carman who was working on adjacent Track No. 4 stated that he smelled something like paint or paint thinner. He said he was going to complain because he was very sensitive to these types of vapors. If indeed the solvent was used to clean the piston head, the one missing open bolt hone would have allowed the excess solvent to enter the cylinder chamber. Thus, the vapors would have had an enclosed area in which to accumulate and create a hazardous situation. In this case, when the second attempt was made to weld on the piston head, a spark would have entered the cylinder chamber through the open bolt hole and caused an explosion to force the large piston upwards.

All the rags in the area, the two Carmen's clothing, and the cylinder along with the mate cylinder on the same side of the car were packaged and sent to Rail Sciences in Omaha, Nebraska for testing. The second cylinder was sent along to be tested in case there was some other foreign substance in the cylinder that could have caused the explosion**.**

The initial Portage County Coroner's report stated that along with blunt trauma injuries to Carman A, there were first and second degree burns to his head along with singed hair. This would indicate that an explosion had occurred.

On Dec. 20, 2002, a meeting was conducted at the CN offices in Rosemont, Illinois to discuss the results of the tests of the cylinders. The President of Rail Services gave a presentation, stating that the MIG welder and argon tank that was used for welding the nut on the broken bolt had been analyzed and found to be normal. The contents of the Penray Gum-solve cans were analyzed, along with the rags and clothing found at the accident site. The contents of both the suspect can of Gum-solve found on the car's crossover platform and an exemplar can of gum-solve were consistent with the labeling and the Material Safety Data Sheet (MSDS). The major ingredients of Gum-solve are Acetone, Toluene, and Xylene.

The findings of the comparison analysis of the failed cylinder and the exemplar cylinder were that residue in the failed cylinder had 300 times the level of Toluene compared to the exemplar cylinder. The failed cylinder had nine times the Acetone levels and 200,000 times the level of

Xylene. The failed cylinder also had 60,000 times the level of Ethyl-benzene, and the exemplar cylinder had none. In addition, the rags and clothing from the site were also found to have the same ingredients from the Gum-solve on them**.**

In conclusion, the use of Penray Gum-solve on the side dump air cylinder resulted in the solvent entering the enclosed cylinder where it began vaporizing. The welding process on the cylinder's piston provided the source of ignition which caused the vaporized Gum-solve to combust, and the cylinder to extend rapidly, causing the fatality and injury to the Carmen**.** This also would be consistent with the statement of the Carman working on the adjacent track that he smelled something which caused him irritation. The vapors from the Gum-solve are heavier than air. The Carman was working in a pit on the next track near the location where the two Carmen had placed the air cylinder. The vapors hugged the ground and caused him to experience an irritation. In interviews, Carman B consistently denied that he used or saw Carman A use the Gum-solve**.**

The toxicological tests on Carman A were negative.

As a result of the post-accident investigation's findings, CN issued a safety flash report stating that all defective air side dump cars with air cylinders needing repair were to be home-shopped to Winnipeg, Manitoba, Canada, where a private contractor would perform the repairs to the air cylinders.

APPLICABLE RULES

CN has not issued any type of safety rule violation against the Carmen. However, Safety Rule M-33, Welding and Cutting, of the CN, U.S. Mechanical Safety Rule Book states:

4. Do not cut, weld, or perform work involving ignition sources on containers that may contain flammable or poisonous solid liquids or vapors**.**

SUMMARY OF FE-28-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: CSX Transportation, Incorporated
Location: Cincinnati, Ohio
Region: 2

Month: November
Date: Nov. 15, 2002
Time: 5:20 a.m., EST

Data for All Fatally Injured Employee(s)

Outbound Lead Car Inspector
51 years old
29 years of service
Last rules training: April 1, 2002
Last safety training: April 1, 2002
Last physical: March 25, 2002

Data for All Employees (Craft, Positions, Activity)

Craft: Maintenance of Equipment

Positions:

Assignment for CSX Train No. Q54115
Outbound Lead Car Inspector

Yard Assignment Y33514
Engineer
Other crew members (not specified)

Inbound Lead Car Inspector
Hump Yard Master
Hump Foreman

Activities: Car inspection and switching, simultaneously

EVENT

A Car Inspector was fatally injured when the truck he was driving on the cart path crossing was struck by an auto carrier rail car, the north car of a switching move.

SUMMARY OF FE-28-02 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

After their train had been standing idle, the switching crew, as instructed, conducted a "blind shove" move toward the hump at the cart path crossing at the same time the Car Inspector was driving his truck across. The truck and train then collided. ***The Car Inspector did not anticipate the train's movement; neither were the switching crew members able to see the Car Inspector.*** At the time of the incident, the "blind shove" move was in accordance with the railroad's operating rules. However, following the incident, a Terminal Superintendent Bulletin was issued ordering Train Directors in the future to announce the shove of a hump cut on the Car Inspector's radio channel.

PCF No. 2

In non-compliance with the railroad's operating rules, the Car Inspector was not sufficiently alert for the movement of cars, locomotives, or equipment at any time, in either direction, on any track.

REPORT:	**FE-28-2002**	
RAILROAD:	CSX Transportation, Incorporated	
LOCATION:	Cincinnati, Ohio	
DATE & TIME:	Nov. 15, 2002; 5:20 a.m., EST	
EVENT[1]:	A Car Inspector was fatally injured when the truck he was riding on the cart path crossing was struck by an auto carrier, the north car of a switching move.	
EMPLOYEE:	Craft:	Maintenance of Equipment (MOE)
	Activity:	Operating Motor Vehicle
	Occupation:	Car Inspector
	Age:	51
	Length of Service:	29 Years
	Last Rules Training:	April 1, 2002
	Last Safety Training:	April 1, 2002
	Last Physical:	March 25, 2002

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On Nov. 14, 2002, the employee went on duty at 11 p.m. at CSX's Queensgate Yard, in Cincinnati, Ohio, as the Outbound Lead Car Inspector. On Nov. 15, 2002, the Lead Car Inspector received instructions to do a set-and-release air brake test on CSX Train No. Q54115. He was informed Q54115 would be stopped on the east open track, where he could have access to the rear of the train. He was operating CSX pick-up truck 90029, equipped for the Outbound Lead Car Inspector, and proceeded south to a location where he could position himself for observation of the rear car of Q54115.

After reaching its destination, inbound Train No. Q51214, which was 4,829 feet long, was left standing on receiving yard Track No. R8, waiting to be humped. The crew of Yard Assignment Y33514 had coupled Locomotives CSXT 2415 and CSXT 1055 to the south end of the cars on Track No. R8, and was preparing to shove them north over the hump. Auto carrier TTGX 976118, the north

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[1] "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

car on Track No. R8, was standing south of a paved cart path that crossed Track No. R8 near the north end.

Inbound freight car inspections were made from motorized carts equipped for that purpose at Queensgate Yard. There were paved paths throughout the yard providing access for the carts. According to a statement made to FRA, TTGX 976118 was standing about half the length of an auto carrier (47 feet) south of the cart path crossing. The Terminal Superintendent's Notice No. 21, dated June 6, 1998, required all transportation crews when yarding trains in the R yard to leave them 25 feet from a cart crossing.

When Train No. Q54115 stopped on the east open track, the rear car of the train was north of the cart path crossing on Track No. R8, and north of the Outbound Lead Car Inspector's position on the south road. He backed his truck north on the South road and backed onto the cart path crossing on Track No. R8. The Engineer of Yard Assignment Y33614, another hump assignment working in the area, observed the truck back onto the cart path crossing and remain there for about a minute. He did not see the truck leave the crossing, and left the immediate area before the accident occurred. It is not known how long the truck remained on the crossing.

At the time the Engineer of Y33614 observed the movement of the pick-up truck, he was moving Locomotives CSXT 2414 and CSXT 1054 from the hump crest to the car shop lead track, then going to lunch. The locomotives were operated south from the crest on the hump lead track until they cleared the switch on Track No. R8 where they could begin their reverse move (north) toward the car shop lead track. When they stopped at the end of the southbound movement, the locomotives were clear of the car shop lead switch, and through the next switch to the south headed toward Track No. R7.

In the area of the accident, the south road was a straight, 1-paved lane, oriented generally north and south. The east open track was immediately next to the east side of the south road, and receiving yard Track No. R8 was immediately to the west. The east open track and Track No. R8 were parallel to the south road in this area.

The receiving yard was illuminated by lights mounted on towers. Visibility of a freight car was several hundred feet when viewed in open areas on a night with similar weather conditions. In areas with rail equipment nearby on both sides (between cars), visibility was reduced.

At the time of the accident, it was dark and cloudy. The temperature was 46^{o} F.

THE ACCIDENT

At about 5:19 a.m. on Nov. 15, 2002, the crew of Yard Assignment Y33514 received instructions from the Train Director to start shoving Track No. R8 toward the hump. The movement toward the hump was a blind shove. When the north car on Track No. R8, Auto Carrier TTGX 976118, reached the cart path crossing, it struck the Outbound Lead Car Inspector's truck on the passenger side and started shoving it north on Track No. R8. The event recorder download from Locomotive CSXT 2415 indicated it was moving at 4 mph at the time of the accident.

Radio broadcast transcripts indicated that at about 5:20 a.m., the Outbound Lead Car Inspector called on the Car Inspector's radio channel (20) to stop the movement on Track No. R8. This transmission was heard by the Inbound Lead Car Inspector, who phoned the Hump Yard Master. The Hump Yard Master monitored a different radio channel. The Hump Yard Master called the Hump Foreman and notified him to stop the movement on Track No. R8. At about 5:21 a.m., the Hump Foreman notified the Engineer on Train No. Y33514 to stop, and he took immediate action to do so. The Engineer was operating Train No. Y33514's locomotives manually at the time of the accident. They were not placed in automatic hump control at any time prior to or during the accident.

Before the shoving movement came to a stop, the Car Inspector's truck was shoved about 360 feet north of the cart path crossing before coming to rest upside-down, underneath the north end of TTGX 976118, and was on fire. The Car Inspector was severely injured and ejected from the vehicle about 20 feet south of where it came to rest. The Cincinnati Fire Department, Cincinnati Police Department, and Hamilton County Coroner responded to the accident. At 9:45 a.m., the Coroner pronounced the Car Inspector dead and transported his body from the accident site.

POST-ACCIDENT INVESTIGATION

FRA's post-accident investigation included compliance evaluations of applicable rules pertaining to the operation of Train No. Y33514, operation of the motor vehicle, and gathering necessary documentation.

The accident was investigated by CSX, FRA, the Ohio Public Utilities Commission, the Cincinnati Fire Department, the Cincinnati Police Department, and the Hamilton County Coroner.

The Coroner's report established the cause of death as an exsanguinating hemorrhage due to a crushing injury to the torso. Federal post-accident toxicological tests were made on the deceased, the crew of Y33514, and the Train Director on duty at the time of the accident. Results were negative.

APPLICABLE RULES

Publication - *CSXT Safe Way, Engineering & Mechanical Departments, 2002*
Section - On Or About Tracks

Rule 16 : When working on or about tracks:

a) Be alert for the movement of cars, locomotives, or equipment at any time, in either direction, on any track.

Although the movement to the hump was made as a blind shove, Train No. Y33514 was being operated in accordance with CSX Operating Rules.

After the accident, a Terminal Superintendent Bulletin was issued ordering the Train Director to announce the shove of a hump cut on the Car Inspector's radio channel.

SUMMARY FOR FE-29-02
SELECTED AND POSSIBLE CONTRIBUTING FACTORS

SELECTED FACTORS

Railroad: Norfolk Southern Corporation
Location: Enola, Pennsylvania
Region: 2

Month: November
Date: Nov. 18, 2002
Time: 11:40 a.m., EST

Data for Fatally Injured Employee(s)

Carman
49 years old
28 years of service
Last rules training: N/A
Last safety training: Oct. 29, 2002
Last physical: June 15, 1998

Data for All Employees (Craft, Positions, Activity)

Craft: Maintenance of Equipment

Positions:

Carman
Mechanical Supervisor
Ten Other Carmen on site

Maintenance-of-Way Foreman
Paving Contractor (Central Penn Pavers)
Truck Driver (Central Penn Pavers)
Another employee of the paving company

Senior General Foreman
General Foreman

Activity: Attempting to remove a loading ramp's defective hydraulic pump for repair.

SUMMARY FOR FE-29-02 CONTINUED

SELECTED FACTORS CONTINUED

EVENT

A Carman was fatally injured when he was crushed by an elevated ramp which fell on him as he was attempting to remove the ramp's defective hydraulic pump for repair.

POSSIBLE CONTRIBUTING FACTORS

PCF No. 1

The Carman was assigned to release the hydraulic pressure to lower the ramp, and then lift the steel grating to disconnect the hydraulic hose and remove the four bolts that held the pump to the inside of the ramp frame. Investigators concluded that the pump could then have been removed from the top without going under the ramp. ***They concluded that the Carman had failed to position himself clear of the portable ramp when he released the hydraulic pressure, resulting in the fatal incident.***

PCF No. 2

Investigators observed that a decal on the side of the ramp contained instructions for its use, advising workers to see the owner's manual for operating and maintenance instructions. However, the railroad was unable to provide an owner's manual when requested. The Carman needed instructions on the safest way to perform this potentially dangerous task.

REPORT:	**FE-29-2002**	
RAILROAD:	Norfolk Southern Corporation (NS)	
LOCATION:	Enola, Pennsylvania	
DATE & TIME:	Nov. 18, 2002; 11:40 a.m., EST	
EVENT[1]:	A Carman was fatally injured when he was crushed by an elevated ramp which fell on him as he was attempting to remove the ramp's defective hydraulic pump for repair.	
EMPLOYEE:	Craft:	Maintenance of Equipment (MOE)
	Activity:	Repairing a gondola rail car
	Occupation:	Carman
	Age:	49 years old
	Length of Service:	28 years
	Last Rules Training:	N/A
	Last Safety Training:	Oct. 29, 2002
	Last Physical:	June 15, 1998

CIRCUMSTANCES PRIOR TO THE ACCIDENT

Subsequent to being off work in excess of 48 hours, a Carman reported for duty at 6 a.m., Nov. 18, 2002 at the NS Car Shop in Enola, Pennsylvania. After the 6 a.m. daily safety meeting, the Carman went to work on the No. 7 Track, adjacent to the Enola Car Shop Office. His assignment that day was to work in the coil steel gondola program. He was in the process of performing a single car test on Gondola Car No. CR 627347, which was standing on Track No. 7, when he took a break for lunch. After lunch, the Carman met with his Mechanical Supervisor and discussed making repairs to a portable ramp used to load and unload material from trucks and highway trailers. At about 10:50 a.m., the Carman and his Supervisor left the lunch room and walked the portable ramp. The ramp was located about 360 feet south of the Car Shop Office between the No. 7 Track and No. 9 Track in a material storage area at the end of a parking

[1] "Event" is defined as "occurrence that immediately precedes and directly results in the fatality." Possible contributing factors are identified in the following report and attached summary.

lot. At the loading ramp, the Supervisor instructed the Carman to remove the hydraulic pump by lifting the grating from above the pump, then unbolting the inside of the ramp and removing it from the top. The removal process involved unfastening four cap bolts and disconnecting a hydraulic line to free the pump. The hydraulic line that was connected to the pump ran to two hydraulic cylinders that raised and lowered the ramp. The Supervisor told the Carman that the removal job was not urgent, but that he would like to have it done before the end of the day so he could drop the pump off for repairs that evening. He then told the Carman to finish testing the air on a car, CR 726347, which was standing on the No. 7 Track located about 190 feet north of the pump. At about 11:07 a.m., the two men departed with ten Carmen returning to work on the car on the No. 7 Track, and the Supervisor headed toward the parking lot at the south end of the car shop office. On his way to the car shop, the Supervisor stopped to talk with a Maintenance-of-Way Foreman who was working with a Paving Contractor (Central Penn Pavers), paving the parking area south of the car shop office.

The accident area was located about 110 feet south of where the parking lot pavement ended. The ramp was sitting on level ground covered with limestone chips. Central Penn Pavers was operating paving equipment and hauling blacktop about 200 feet north of the ramp, while paving the Car Shop Office parking lot. No one observed the Carman's actions or what occurred after he left the Supervisor at 11:07 a.m.

The weather was clear and dry, and the temperature was 50^{o} F.

THE ACCIDENT

At 11:30 a.m., a Truck Driver for Central Penn Pavers, who was delivering asphalt, entered the Senior General Foreman's office and said to call 911 because someone was trapped under a piece of equipment. The Senior General Foreman called 911 immediately.

Before going to the office, the Truck Driver had contacted another employee of the paving company and told him to check on the man under the ramp. After he went to the ramp, the paving company employee ran back toward the car shop and encountered an NS General Foreman and told him that there was a man trapped under the ramp who appeared to be dead. The Foreman ran to the shop, got a fork lift, and drove to the scene. Using the fork lift, he raised the ramp off the Carman at 11:32 a.m. Another paving company employee at the scene felt the Carman's pulse and replied there was none. At 11:42 a.m., the East Pennsboro EMS arrived, and the East Pennsboro Police arrived at 11:50 a.m. The Cumberland County Coroner arrived at 12:30 p.m. and pronounced the Carman dead at the scene. The body was removed at 12:52 p.m.

According to the General Foreman, when he arrived at the ramp, the Carman was lying with the bottom half of his body outside of the ramp and the upper half beneath the ramp. He was positioned near the middle of the ramp, under the side facing west, pinned between the ground and the bottom side of the ramp. When the ramp was raised, he was still wearing his hard hat and glasses; and the wrench he used to disconnect the hydraulic line was still in his hand.

POST-ACCIDENT INVESTIGATION

An initial FRA investigation of the accident scene was conducted on Nov. 18, 2002 between 1:15 p.m. and 3:00 p.m. An inspection of the loading ramp revealed that three of the cap bolts supporting the ramp had been removed, and it was being supported by the remaining one bolt. The hydraulic line between the ramp and support cylinders was disconnected at the pump, and hydraulic fluid was spread over the area under the ramp. The ramp was at the bottom of its travel with 3 ½ inches of clearance between the ground and the side of the ramp at the spot where the Carman was lying.

A subsequent inspection and investigation on Nov. 19, 2002, revealed the following: the material unloading ramp was last used on Friday, Nov. 15, 2002 to unload material from a trailer. During the unloading process, the Mechanical Supervisor and Carman using the ramp noticed that the hydraulic pump would not raise the end of the ramp, therefore, they had to use a fork lift to raise it onto the trailer bed. It was the Monday following this event that the Mechanical Supervisor told the Carman to remove the pump for repairs. On Tuesday, NS officials conducted an inspection of the ramp with FRA officials observing. Using the fork lift, they were able to raise the elevated end to its uppermost limit of 50 inches. A measurement was taken at the location where the Carman was pinned. It measured 15 ½ inches. When the ramp was lowered with the fork lift, it returned to its position at the time of the accident, with 3 ½ inches of clearance at the spot the Carman was lying.

The portable loading ramp was manufactured by Equipment Company of America located in Hialeah, Florida. The ramp was constructed of aluminum with a steel grating on the top and had a capacity of 15,000 pounds. It weighed 3,789 pounds and measured 35 feet, 10 inches long and 5 feet, 10 ½ inches wide. A decal on the side of the ramp contained instructions for its use. It also advised workers to see the owner's manual for operating and maintenance instructions. The railroad could not provide the owner's manual when FRA investigators asked to see it.

The job the Carman was assigned to perform comprised releasing hydraulic pressure to lower the ramp and then lifting the steel grating to disconnect the hydraulic hose and remove the four bolts that held the pump to the inside of the ramp frame. The pump then could be removed from the top without going under the ramp.

Investigators concluded that the Carman had failed to position himself clear of the portable ramp when he released the hydraulic pressure, resulting in the fatal incident. At the time of this report, the Harrisburg Office of OSHA also conducted an investigation with consistent findings. The Cumberland County Coroner's Office performed toxicological testing, and the results were negative.

APPLICABLE RULES

The investigators determined that the Norfolk Southern Corporation's Safety and General Conduct Rules, effective April 01, 1999, did not include a safety rule to cover the work being performed at the time of the accident.

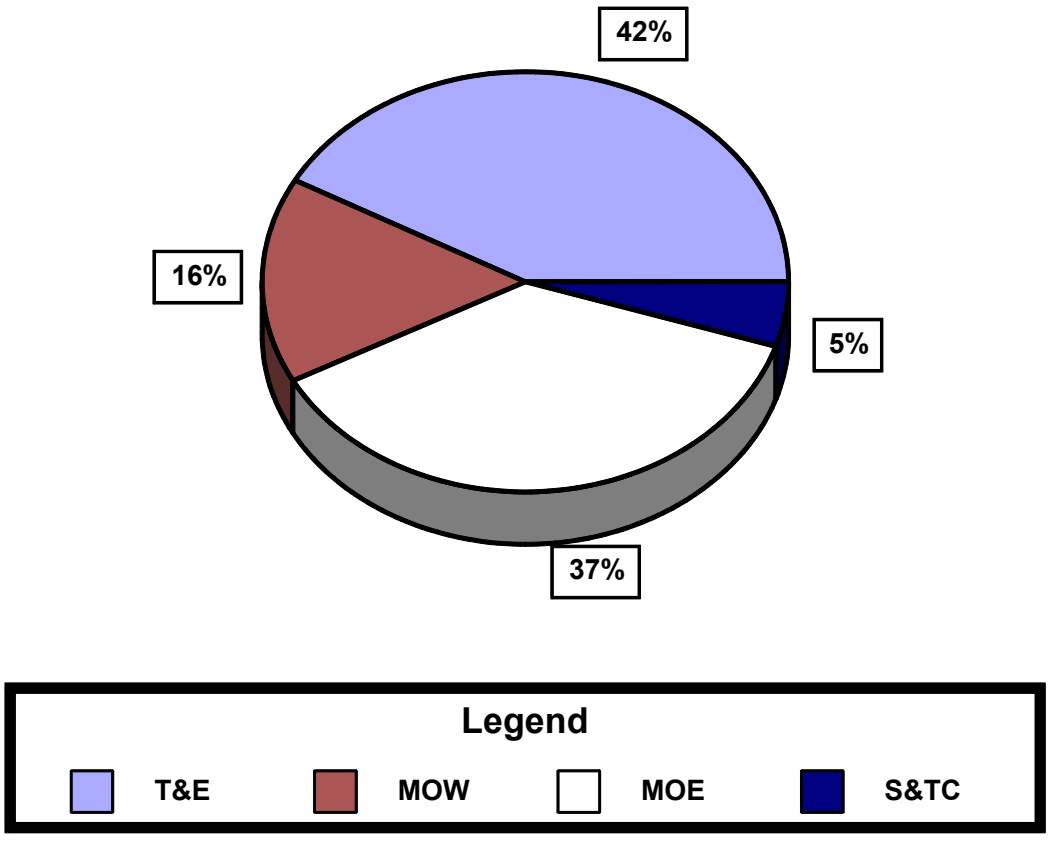
APPENDICES A THROUGH I

(BAR AND PIE CHARTS)

APPENDIX A

2002 Railroad Employee Fatalities

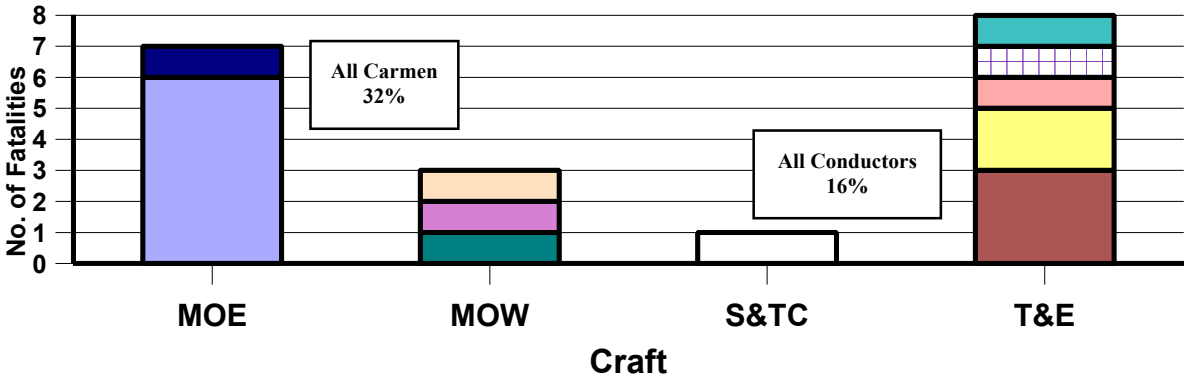
By Craft

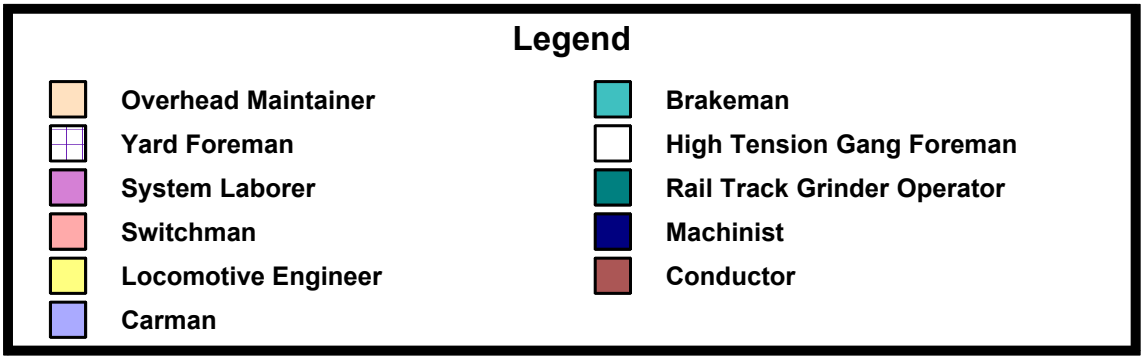


APPENDIX B

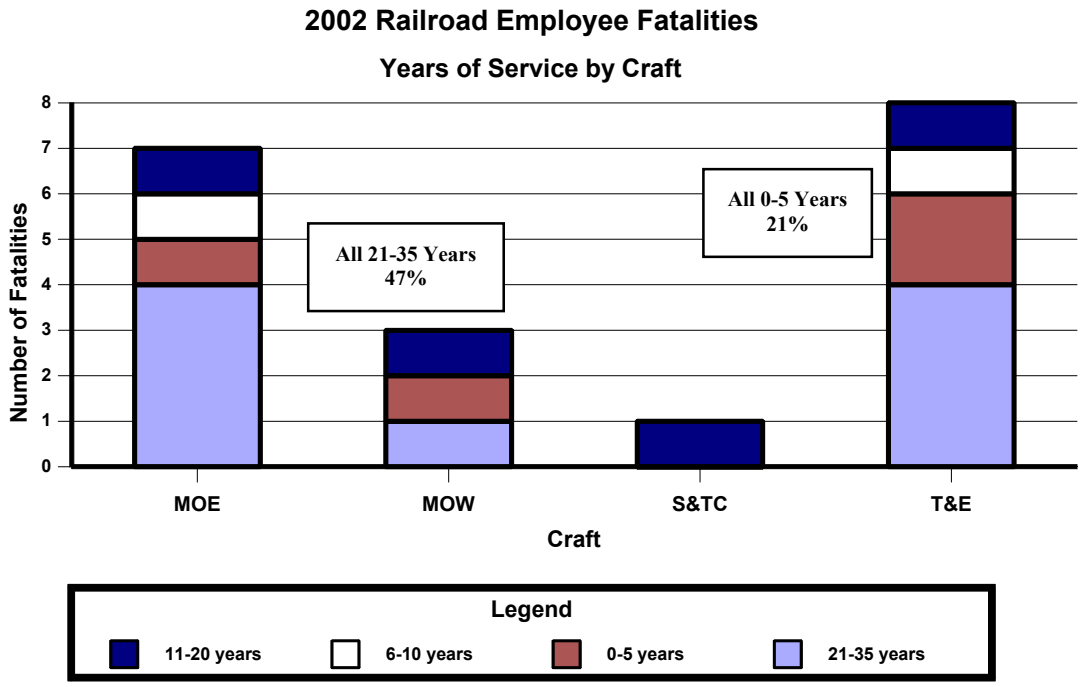
2002 Railroad Employee Fatalities

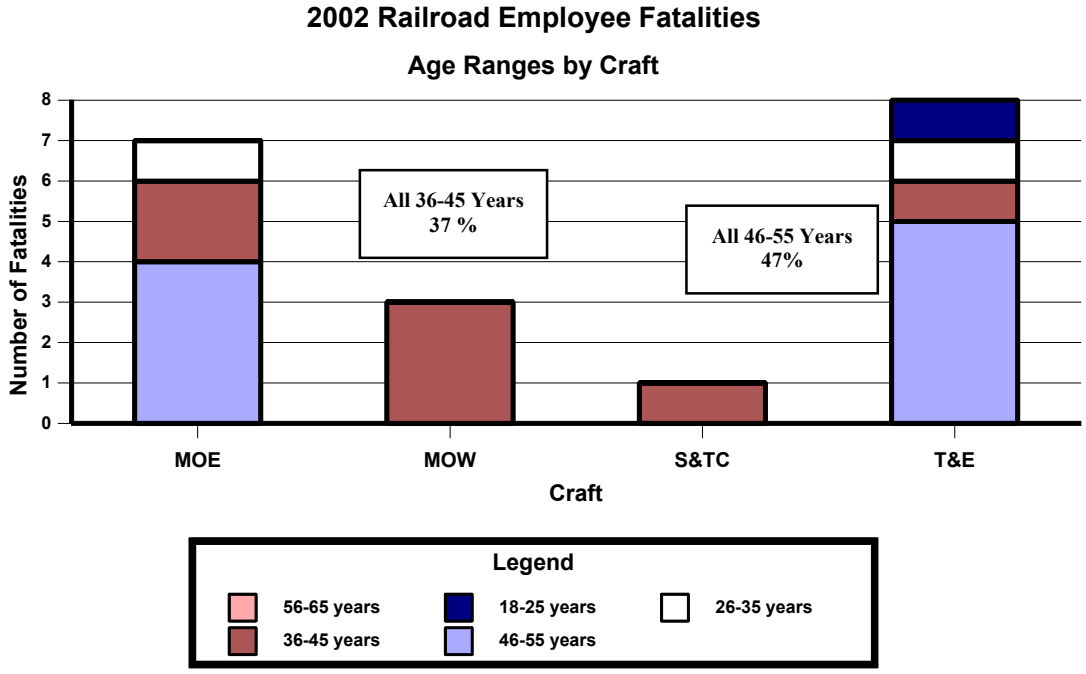
By Craft and Position



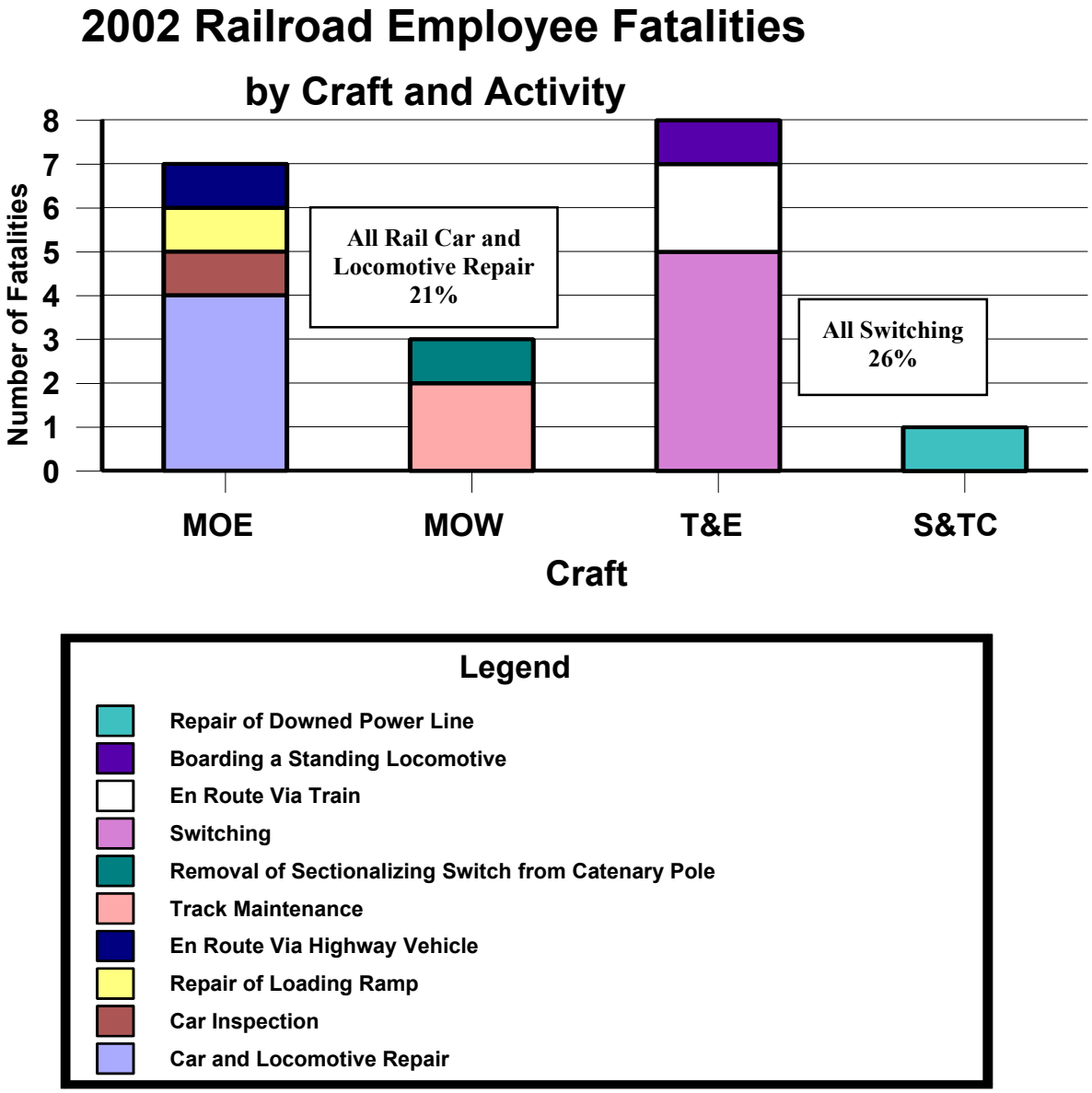


APPENDIX C


2002 Railroad Employee Fatalities
Years of Service by Craft
Number of Fatalities
0
1
2
3
4
5
6
7
8
All 21-35 Years
47%
All 0-5 Years
21%
MOE
MOW
S&TC
T&E
Craft
Legend
11-20 years
6-10 years
0-5 years
21-35 years


2002 Railroad Employee Fatalities
Age Ranges by Craft
Number of Fatalities
0
1
2
3
4
5
6
7
8
All 36-45 Years
37 %
All 46-55 Years
47%
MOE
MOW
S&TC
T&E
Craft
Legend
56-65 years
36-45 years
18-25 years
46-55 years
26-35 years

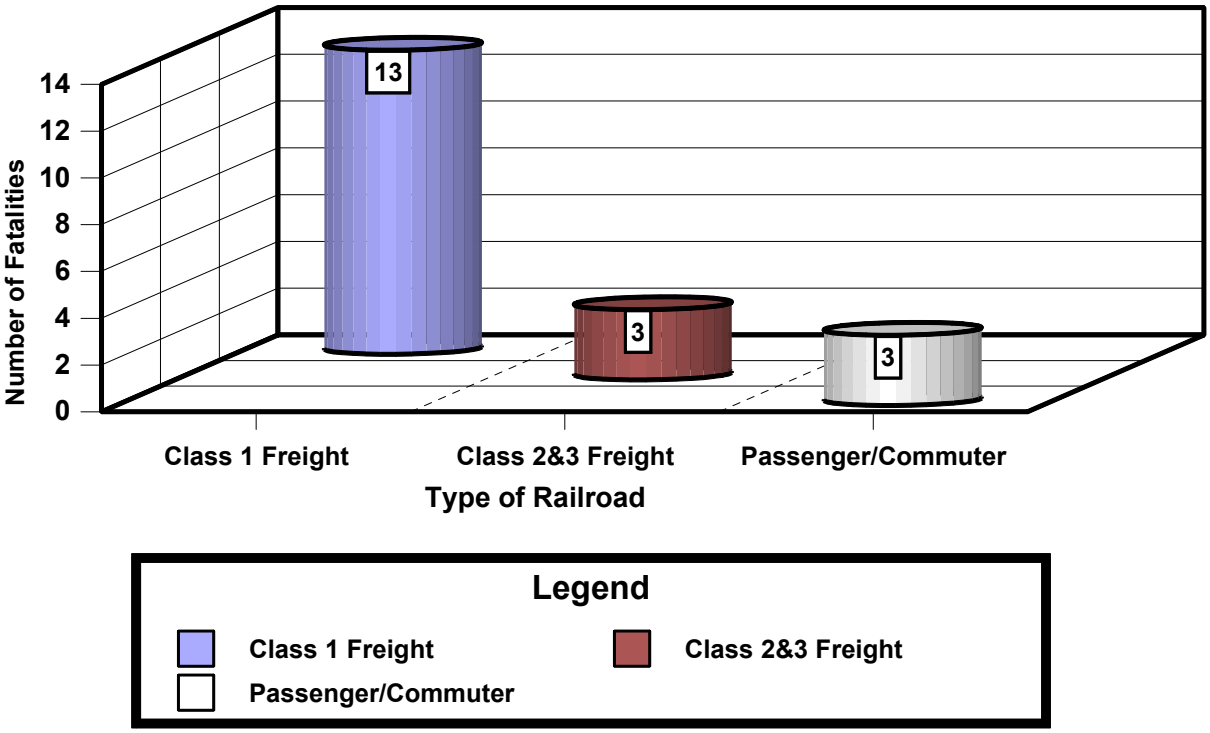
APPENDIX D


2002 Railroad Employee Fatalities
by Craft and Activity
Number of Fatalities
8
7
6
5
4
3
2
1
0
All Rail Car and Locomotive Repair 21%
All Switching 26%
MOE
MOW
T&E
S&TC
Craft
Legend
Repair of Downed Power Line
Boarding a Standing Locomotive
En Route Via Train
Switching
Removal of Sectionalizing Switch from Catenary Pole
Track Maintenance
En Route Via Highway Vehicle
Repair of Loading Ramp
Car Inspection
Car and Locomotive Repair

APPENDIX E

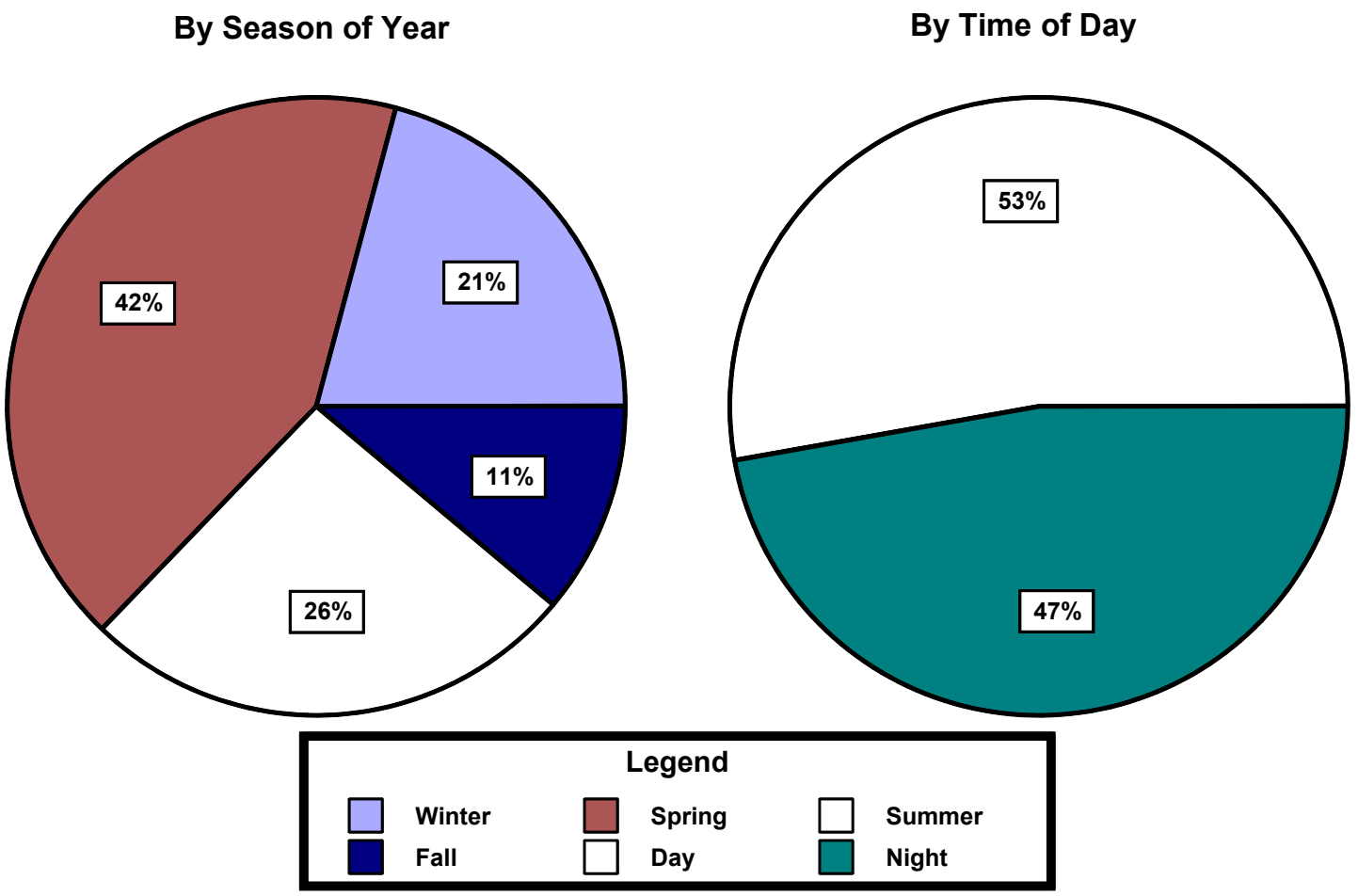
2002 Railroad Employee Fatalities

By Type of Railroad



APPENDIX F

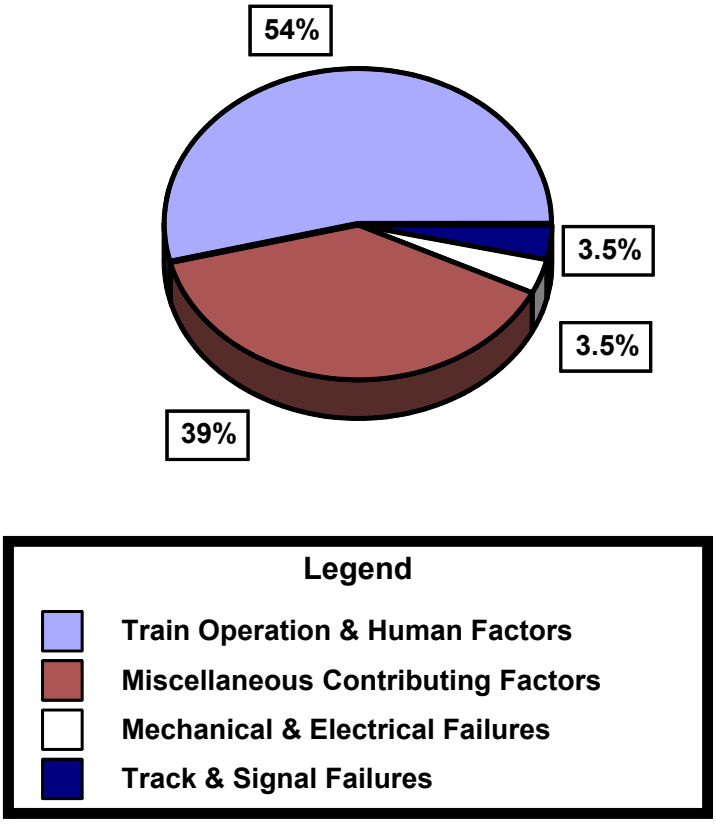
2002 Railroad Employee Fatalities



APPENDIX G

2002 Railroad Employee Fatalities

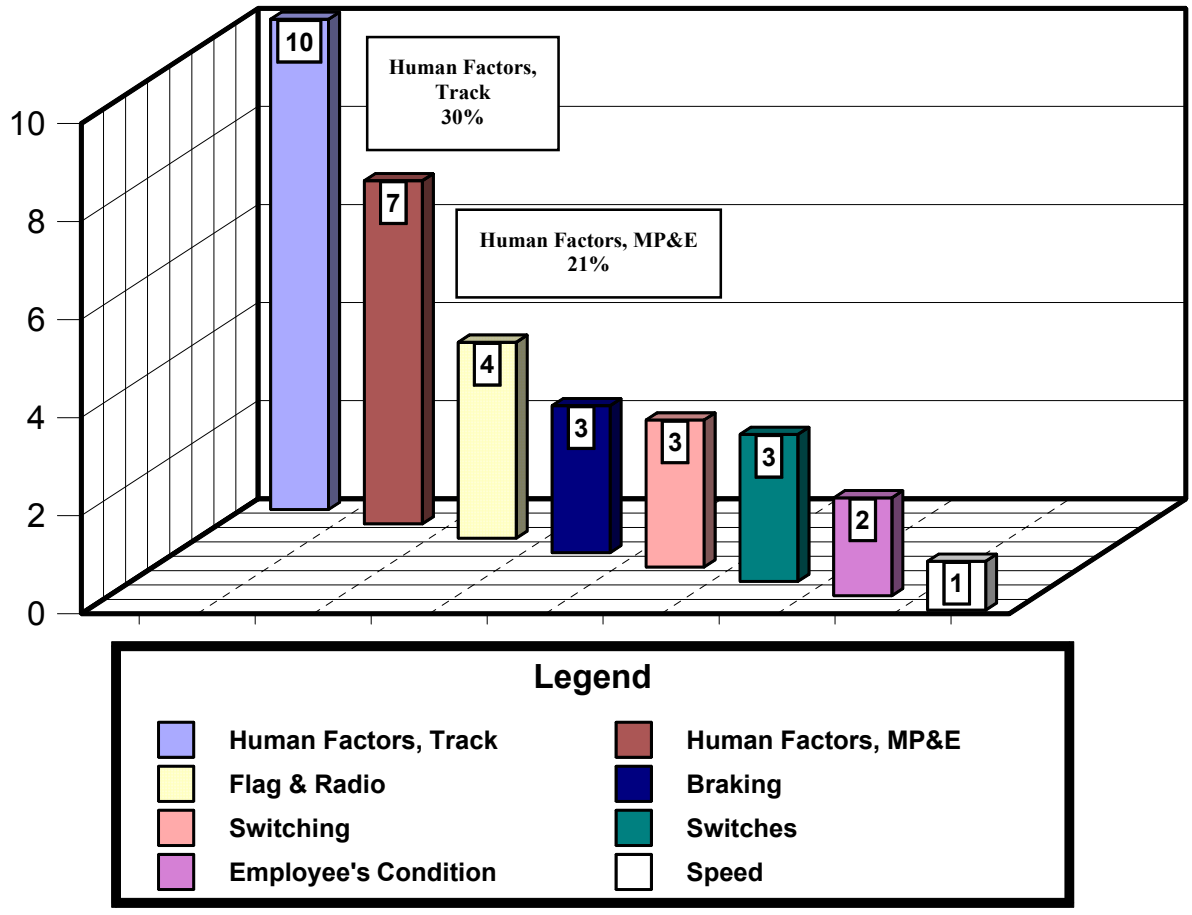
Major Possible Contributing Factor Categories



APPENDIX H

2002 Railroad Employee Fatalities

Train Operation & Human Factors Involved



APPENDIX I

2002 Railroad Employee Fatalities