

2007 RAILROAD EMPLOYEE FATALITIES:

CASE STUDIES AND ANALYSIS

Office of Safety Washington, DC 20590

March 2009

TABLE OF CONTENTS

SECTION	PAGE NUMBER
EXECUTIVE SUMMARY	1-7
Complexity of Fatalities	1-2
Findings	2-7
WHO were most of the fatally injured employees?	2-3
WHAT were most of the fatally injured employees when they were injured?	doing 3
WHERE did most of the railroad employee fatalitie occur?	es 4
WHEN did most of the fatalities occur?	4
WHY did most of the fatalities occur?	5-7

INDIVIDUAL SUMMARIES AND REPORTS

FE-03-07

Long Island Railroad Valley Stream, New York 01/17/07

FE-06-07

Norfolk Southern Corporation Piketon, Ohio 03/12/07

FE-12-07 Burlington Northern Santa Fe Corporation Berry, Arizona 07/08/07

FE-15-07 Canadian National Railway Fulton, Kentucky 07/27/07

TABLE OF CONTENTS CONTINUED

INDIVIDUAL SUMMARIES AND REPORTS CONTINUED

FE-16-07

Burlington Northern Santa Fe Corporation Rozet, Wyoming 08/02/07

FE-18-07

Indiana Harbor Belt Railroad Company East Chicago, Indiana 08/25/07

FE-19-07

Burlington Northern Santa Fe Corporation Stockton, California 08/30/07

FE-20-07

Union Pacific Company Martinez, California 10/23/07

FE-21-07

CSX Transportation, Incorporated Russell, Kentucky 10/27/07

FE-25-07

Burlington Northern Santa Fe Corporation Bristol, Illinois 12/28/07

APPENDICES

BAR AND PIE CHARTS

A through I

А

В

2007 Railroad Employee Fatalities by Craft (3-D Pie Chart)

2007 Railroad Employee Fatalities by Craft and Position (Stacked Bar Chart)

TABLE OF CONTENTS CONTINUED

APPENDICES CONTINUED

BAR AND PIE CHARTS	A through I
2007 Railroad Employee Fatalities: Years of Service by Craft (Stacked Bar Chart)	С
2007 Railroad Employee Fatalities: Age Ranges by Craft (Stacked Bar Chart)	С
2007 Railroad Employee Fatalities by Craft and Activity (Stacked Bar Chart)	D
2007 Railroad Employee Fatalities by Type of Railroad (3-D Bar [Cylinder] Chart)	Е
2007 Railroad Employee Fatalities by Season of Year (Pie Chart)	F
2007 Railroad Employee Fatalities by Time of Day (Pie Chart)	F
2007 Railroad Employee Fatalities: Major Possible Contributin Factor Categories (3-D Pie Chart)	ng G
2007 Railroad Employee Fatalities: Train Operation & Human Factors Involved (3-D Bar Chart)	Н
2007 Railroad Employee Fatalities: Miscellaneous Contributin Factors (3-D Angled Bar Chart)	g I

OVERVIEW OF 2007 RAILROAD EMPLOYEE FATALITIES

EXECUTIVE SUMMARY

This document, entitled "2007 Railroad Employee Fatalities: Case Studies and Analysis," was developed to promote and enhance awareness of many unsafe behaviors and conditions that typically contribute to railroad employee fatalities, and 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 2007's 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 <u>individual</u> fatality, particularly the possible contributing factors (PCFs). This format allows the reader to walk through and analyze each fatality scenario. PCFs are expressed as brief narrative statements such as "The rail cars that struck the Conductor were set in motion by a mismatch coupling."

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 2007 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 2007, 100 percent of all fatalities had three or more PCFs. Fatalities with five or more PCFs represented 70 percent, and fatalities with more than six PCFs represented 40 percent. Fatalities ranged in complexity from three PCFs to seven PCFs.*

As an example, Report FE-03-07 describes a complex fatal incident in which a Track Foreman was struck by a westbound train and fatally injured while supervising the replacement of switch

timbers. The incident involved the following seven PCFs, which reveal several errors including systemic problems, that resulted in the fatal incident:

- Immediately prior to the incident, the Track Foreman was bent over, appearing to study the track, and did not see the approaching train. Another MOW worker warned him, but too late to save his life. Interviews revealed that the Foreman had a habit of looking down and observing track conditions;
- The Track Foreman entered the foul area without receiving a return-to-work signal from the Gang Watchman;
- During the time frame of the incident, the sun would have been in the Foreman's eyes as he looked eastward toward the westbound train, adversely impacting visibility. Investigators observed this situation during the same time frame a few days after the incident;
- The Track Foreman was supervising a large number of employees, many of whom had less than one year of service;
- The railroad's Engineering Department consistently failed to meet the requirements of the SAFER¹ compliance monitoring and testing program;
- Seeing Train No. 34 pass by on the adjacent track immediately before the approach of Train No. 55 may have been a distraction for the Foreman; and
- The LIRR uses Gang Watchmen for a majority of track work performed. A safer method (especially when large numbers of workers are involved) would have been an absolute block, which would comprise slowing down trains by work zones and informing workers of approaching trains, also by work zones.

FINDINGS

WHO were most of the fatally injured employees?

• Craft: Transportation and Engine Employees

1

In 2007, fatally injured Transportation and Engine (T&E) employees represented 60 percent of railroad employee fatalities, and fatally injured Maintenance of Way (MOW) employees represented 40 percent of railroad employee fatalities. There were no fatalities among Maintenance of Equipment employees or Signal and Train employees. (*See Appendix A, 3-D pie chart entitled "2007 Railroad Employee Fatalities By Craft."*)

[&]quot;SAFER" stands for Situational Awareness for Efficient Railroading.

• Position: Conductors

In 2007, 30 percent of all fatally injured employees were Conductors, and 20 percent were Track Foremen. The remaining 50 percent comprised a Brakeman, Bridge Inspector, Crane Operator, Yard Helper, and Yard Foreman.

(See Appendix B, stacked bar chart entitled "2007 Railroad Employee Fatalities by Craft and Position.")

• Experience: 21 years and over

Most fatally injured employees in 2007 (40 percent) were very experienced with 21 plus years of work experience. Fatally injured employees with 0-5 years of work experience represented 30 percent of the year's total fatalities. Fatally injured employees with 6-10 years of work experience represented 20 percent, and those with 11-20 years of work experience represented 10 percent of the year's total fatalities.

(See Appendix C, stacked bar chart entitled "2007 Railroad Employee Fatalities: Years of Service by Craft.")

• Age Range: 46-55 years

In 2007, all fatally injured employees were at least 36 years of age. Fifty percent of all fatally injured employees were concentrated in the 46-55 year age range, with employees in the 56-65 year age range representing 30 percent of the year's total fatalities. The remaining employees, 36-45 years of age, represented 20 percent of total fatalities.

(See Appendix C, cluster bar chart entitled "2007 Railroad Employee Fatalities: Age Ranges by Craft.")

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

• Activity: Switching

In 2007, 60 percent of all fatally injured employees were involved in switching. The remaining 40 percent were involved in bridge construction, bridge inspection, replacing switch timbers, and surfacing track.

(See Appendix D, stacked bar chart entitled "2007 Railroad Employee Fatalities by Craft and Activity.")

WHERE did most of the railroad employee fatalities occur?

• Type of Railroad: Major Freight Railroads

In 2007, 80 percent of all railroad employee fatalities occurred on major freight railroads, 10 percent on railroads classified as regional or short line, and 10 percent on commuter/passenger railroads. These railroad categories employed approximately 80 percent, approximately 10 percent, and approximately 10 percent of the nation's total railroad employees, respectively.

(See Appendix E, 3-D bar [cylinder] chart entitled "2007 Railroad Employee Fatalities by Type of Railroad.")

WHEN did most of the fatalities occur?

• Season: Summer

Seasonal equinoxes and solstices for 2007 occurred as follows: spring, March 21; summer, June 21; fall, September 23; and winter, December 22.

In 2007, 50 percent of all fatalities occurred in the summer, 30 percent in the winter, 20 percent in the fall, and none in the spring.

(See Appendix F, pie chart entitled "2007 Railroad Employee Fatalities by Season of Year.")

• Time of Day: Equally Distributed

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 to sunset, and "night" as immediately after sunset until sunrise. In 2007, 50 percent of the fatalities occurred during the day and 50 percent during the night.

(See Appendix F, pie chart entitled "2007 Railroad Employee Fatalities by Time of Day.")

WHY did most of the fatalities occur?

• Major three PCF Categories in descending order:

Miscellaneous Contributing Factors Train Operation and Human Factors Mechanical and Electrical Failures

• Most PCFs: Miscellaneous Contributing Factors²

- In 2007, 50 percent of all PCFs to the year's fatalities were Miscellaneous Contributing Factors, followed closely by 48 percent which were Train Operation and Human Factors³.
- In 2007, the remaining 2 percent of all PCFs were Mechanical and Electrical Failures (a defective knuckle that prevented coupling).

(See Appendix G, 3-D pie chart entitled "2007 Railroad Employee Fatalities: Major Possible Contributing Factor Categories.")

Break-down of Train Operation & Human Factors

• Of all the Train Operation & Human Factors in 2007, one sub-category predominated: Miscellaneous Human Factors, Track at approximately 42 percent.

Miscellaneous Human Factors, Track included becoming distracted while inspecting track as a train approached; fouling the track without a return-to-work signal; inadequate method of on-track safety; fouling the track without on-track safety; slow orders not in effect on the adjacent track; incorrect and inadequate method of on-track safety within the limits of a manual interlocking or control point; fouling the track; angle of the crane's boom not adjusted prior to or during its rotation, causing the crane to tip over; non-compliance with the railroad's pile driving instructions regarding crane boom weight, angle, and radius; and becoming distracted by a train passing on an adjacent track.

• Non-compliance with General Switching Rules ranked second with approximately 21 percent of all Train Operation/Human Factors.

² Miscellaneous Contributing Factors included environmental conditions, unusual or inappropriate working conditions, unprepared employees, systemic problems, inadequate coordination/communication, and poor safety record.

³ Train Operation & Human Factors included miscellaneous human factors, track; non-compliance with general switching rules; employee's condition; train handling; improper hand, train & radio signals; improper use of switches; and improper use of brakes.

This sub-category included lack of communication between the Conductor and Locomotive Engineer regarding how the movement was being protected; fouling the track between standing equipment to make an adjustment, without making sure another crew member was in control of the equipment; failure to move standing cars clear of the crossover; failure to verify whether equipment had coupled; and failure to couple.

- Ranking third, the sub-category Employee's Condition comprised approximately 13 percent of all Train Operation/Human Factors. The condition in each case was fatigue.
- The sub-categories, Train Handling, and Hand, Train & Radio Signals each comprised approximately 8 percent of all Train Operation/Human Factors.

Train Handling included riding on the platform improperly, and failure to stop a shoving movement within one half the specified distance. Hand, Train & Radio Signals included improper radio communication and failure to carry a radio to monitor train transmissions.

• Improper Use of Switches and Improper Use of Brakes each comprised approximately 4 percent. They included switches improperly aligned and failure to secure hand brakes.

(See Appendix H, cluster bar chart entitled "2007 Railroad Employee Fatalities: Train Operation & Human Factors Involved.")

Break-down of Miscellaneous Contributing Factors

• Of all the Miscellaneous Contributing Factors in 2007, two sub-categories predominated: Environmental Conditions at 36 percent, and Unusual or Inappropriate Working Conditions at 20 percent.

Environmental Conditions included poor visibility due to sun in the eyes; poor visibility due to inadequate artificial lighting; poor visibility due to the curvature of tracks; poor visibility due to heavy rain; poor visibility due to the combination of the right-hand curve of the track, glare from the sun, and shadows from surrounding structures; ambient noise from construction and the overhead freeway interfering with the ability to hear the horn; tamper machine too loud to hear the locomotive horn; and ground wet with accumulated snow, causing slippery footing.

Unusual or Inappropriate Working Conditions included the supervision of too many inexperienced employees; employee functioning as a Watchman while performing other duties; the employee's physical position, while manipulating a shadow board, which restricted the ability to see or hear approaching trains; the atypical location of a switch stand and target, forcing the employee to work between two tracks; and an inexperienced employee supervising a less experienced employee.

 Ranking third, Unprepared Employees represented 16 percent of all Miscellaneous Contributing Factors. Systemic Problems and Inadequate Coordination/Communication followed with 12 percent each, and Poor Safety Record represented 4 percent of all Miscellaneous Contributing Factors.

Unprepared Employees included inexperience, failure to carry a lantern when working in the dark, and no safety briefings given to a Bridge Inspector, who was a lone worker.

Systemic Problems included the consistent failure of an Engineering Department to meet SAFER requirements for monitoring and testing; the inadequate response by management to an employee's failed operational tests; and the failure of railroad management to give the proper designation to a bridge which was a control point, where individual train detection was not allowed.

Inadequate Coordination/Communication included the lack of communication between a Dispatcher and Foreman about train movements; inadequate communication between a Supervisor and Yard Helper regarding hazardous conditions; and the failure of the Train Master to warn a yard job crew about hazardous conditions, and to give appropriate instructions.

Poor safety record included an employee's pattern of non-compliance with railroad operation and safety rules.

(See Appendix I, 3-D angled bar chart entitled "2007 Railroad Employee Fatalities: Miscellaneous Contributing Factors.")

INDIVIDUAL SUMMARIES AND REPORTS

(FE-03-07 THROUGH FE-25-07)

SUMMARY FOR FE-03-07 SELECTED AND POSSIBLE CONTRIBUTING FACTORS

Railroad: Long Island Railroad (LIRR) Location: Valley Stream, New York Region: 1

> Month: January Date: Jan. 17, 2007 Time: 9:55 a.m., EST

Data for Fatally Injured Employee(s)

Track Foreman 50 years old 21 years of service Last rules training: Nov. 22, 2006 Roadway Worker training: Jan. 16, 2007 Last safety training: Daily

Data for All Employees (Craft, Positions, Activity)

Craft: Maintenance of Way

Positions:

32 total positions

Track Foreman (Roadway Worker in Charge) Junior Track Foreman Maintenance Gang 233 Maintenance Gang 241 Maintenance Gang 242 Two Electric Traction Gangs Gang Watchman

<u>Activity</u>

Replacing switch timbers

EVENT

A Track Foreman was struck by a westbound train and fatally injured while supervising the replacement of switch timbers.

SUMMARY FOR FE-03-07 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

<u>PCF No. 1</u>

Immediately prior to the incident, the Track Foreman was bent over, appearing to study the track, and did not see the approaching train. Another MOW worker warned him, but too late to save his life. Interviews revealed that the Foreman had a habit of looking down and observing track conditions.

<u>PCF No. 2</u>

The Track Foreman entered the foul area without receiving a return-to-work signal from the Gang Watchman.

<u>PCF No. 3</u>

During the time frame of the incident, the sun would have been in the Foreman's eyes as he looked eastward toward the westbound train, adversely impacting visibility. Investigators observed this situation during the same time frame a few days after the incident.

PCF No. 4

The Track Foreman was supervising a large number of employees, many of whom had less than one year of service.

<u>PCF No. 5</u>

The railroad's Engineering Department consistently failed to meet the requirements of the SAFER¹ compliance monitoring and testing program.

<u>PCF No. 6</u>

Seeing Train No. 34 pass by on the adjacent track immediately before the approach of Train No. 55 may have been a distraction for the Foreman.

<u>PCF No. 7</u>

The LIRR uses Gang Watchmen for a majority of track work performed. A safer method (especially when large numbers of workers are involved) would have been an absolute block, which would comprise slowing down trains by work zones and informing workers of approaching trains, also by work zones.

¹

[&]quot;SAFER" stands for Situational Awareness for Efficient Railroading.

REPORT:	FE-03-2007		
RAILROAD:	Long Island Railroad (LIRR)		
LOCATION:	Valley Stream, New York		
DATE & TIME:	Jan. 17, 2007; 9:55 a.m., EST		
EVENT ² :	The Track Foreman was struck by a westbound train and fatally injured while supervising the replacement of switch timbers.		
EMPLOYEE:	Craft:	Maintenance of Way	
	Occupation:	Track Foreman	
	Age:	50 years	
	Length of Service:	21 years	
	Last Rules Training:	Nov. 22, 2006	
	Roadway Worker Training:	Jan. 16, 2007	
	Last Safety Training:	Daily	

CIRCUMSTANCES PRIOR TO THE ACCIDENT

At 7:30 a.m. on Jan. 17, 2007, an LIRR Track Foreman reported for duty at the Hillside Maintenance Facility. The Foreman received orders to install switch timbers in the Valley Interlocking on Montauk Tracks Nos. 1 and No. 2 at the No. 33 crossover switch. The Foreman was to meet an additional Junior Track Foreman and Maintenance Gang 242 who would assist in the installation of switch timbers. In addition, two Electric Traction gangs (with two men in each gang) were to assist with third rail power brackets that were to be attached to switch timbers. The Senior Foreman was the Roadway Worker In Charge (RWIC).

At approximately 9:55 a.m., the Track Foreman was fatally injured when struck by a westbound LIRR train. The accident occurred on Track No. 1 near milepost 15 of the Montauk Line at the west end of Valley Interlocking in Valley Stream, New York. At this location, the railroad comprises four main line tracks numbered from north to south: Montauk No. 1, Montauk No. 2,

²"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.

Atlantic No. 1, and Atlantic No. 2. The railroad is geographically oriented east and west, corresponding to timetable direction.

The operation of rail traffic for Montauk No. 1 was predominately westbound; Montauk No. 2 traffic was predominately eastbound. The maximum authorized speed for passenger trains operating on Montauk No. 1 and No. 2 was 80 mph. The method of operation over this portion of the railroad is governed by the LIRR Operating Rules and controlled by automatic speed control with cab signals.

The Junior Track Foreman arrived at the Valley Interlocking first between 8:30 a.m. and 9 a.m. and gave a job briefing to Track Gang 242 and the Electric Traction third rail workers. The Junior Track Foreman had $6\frac{1}{2}$ years on the railroad, six months as a Foreman. He was the RWIC. He appointed a Gang Watchman and advised his gang as to the scope of the work to be done. The gang would be working on the east end of the No. 33 crossover switch on Montauk Track No. 2. A short time after 9 a.m., the Senior Track Foreman arrived. The Senior Foreman took over as the RWIC.

The Senior Track Foreman called everyone in for a new job briefing. He dispatched two Gang Watchmen for the work zone, one to the east, and one to the west, and advised the Junior Track Foreman to keep working on the east end of the No. 33 crossover. He confirmed that the area to clear up would be to the north right-of-way slope next to Montauk No. 1. His gangs 233 and 241 would be working on timbers on the west end of the No. 33 crossover on Montauk Track No. 1.

Prior to the incident, the Senior Track Foreman took four track workers to the north side of the interlocking to retrieve new timbers staged beside a set of wooden stairs at the bottom of the slope of the north side bank. A large signal bungalow was next to the stairs on the west side at the top of the slope next to Montauk Track No. 1.

THE ACCIDENT

A short time before 9:55 a.m., both Gang Watchmen sounded their air horns and pointed to the clear up area on the north side of the tracks. Everyone was in the clear as the first train, an eastbound passenger Train No. 34 on Montauk Track No. 2, preceded through the work area at 70 mph. As the last car of the 10-car train passed by the Foreman, he stepped toward Montauk Track No. 1. A second passenger Train No. 55, westbound with ten cars, was approaching the work zone at the same time. The westbound train on Montauk Track No. 1 was traveling at 70 mph. The Senior Track Foreman was on the field side of the Montauk Track No. 1, slightly bent over. Observers thought he was looking at the track. As he stepped closer to the track, one of his track workers yelled to him that another train was coming. At that split second, he turned slightly towards the direction from which the train was approaching. He appeared to try and twist back away from the train, but was clipped by the train, spun around, and sent flying into the signal bungalow.

The Engineer of the westbound train applied the emergency train brakes. The train stopped, and workers ran to try and help the Senior Track Foreman. A 911 call was made. One of the track workers, who was an EMT, assisted with first aid. The Senior Track Foreman attempted to get up, but his crew told him to stay down. The Senior Track Foreman suffered massive blood loss. He was transported by air to Nassau University Medical Center in East Meadow, New York. The Foreman was pronounced dead at 10:29 a.m. on Jan. 17, 2007.

POST-ACCIDENT INVESTIGATION

The FRA inspection of the site revealed a 4-track, tangent main line. The track area was constructed on a high fill section. Sight distance was unobstructed for 4,500 feet to the point of impact for a westward moving train. When looking eastward, the rising sun was in the Foreman's eyes at the point of impact. This condition was observed by investigators at the same time frame as the accident a few days later. At the point of impact, the north right-of-way was eight feet wide, then followed a two-on-one slope to street level. Directly to the west were a set of wooden stairs. Further west was a signal bungalow, which stood eight feet from the north rail of Montauk Track No. 1. To the east was a conduit pipeline. At the point of impact, no third rail power rails were in place. The Valley Interlocking had four tracks from the north to the south. The north track was Montauk No. 1, followed by Montauk No. 2, Atlantic No. 1, and Atlantic No. 2.

Joint FRA and LIRR interviews revealed that the Senior Track Foreman had given a full job briefing to all employees involved in the work to be done at Valley Interlocking. Prior to the impact, the Senior Track Foreman had been checking the new timbers that were staged at the top of the slope of the bank, for size. The timbers were next to the wooden stairs leading up to the track on the north side of Montauk Track No. 1.

When the Watchmen blew their horns for the approaching trains, the Senior Track Foreman instructed the four workers to hold up until the train had passed. The Senior Track Foreman was at the top of the slope at this time. The first train to pass the work site was an eastbound Train No. 34 on Montauk Track No. 2. As the eastbound train continued east of the Senior Track Foreman, he moved closer to Montauk Track No 1. He appeared to be unaware of the second (westbound) Train No. 55 approaching on Montauk Track No. 1. One of the workers with the timbers yelled to him that another train was coming. The Foreman was slightly bent over at the time. At the last second, he twisted to get out of the way. The impact propelled him into the signal bungalow located 15 feet west of him.

According to witnesses standing on the opposite side of the interlocking, the two trains passed each other at about the same time, with the westbound train passing the work location right after the eastbound train. After interviewing witnesses, investigators determined that the Senior Track Foreman was not wearing hearing protection or ear muffs. The Senior Track Foreman was wearing a hooded sweatshirt with the hood down. The interview of the Engineer of the westbound train revealed the Senior Track Foreman's hands were empty. The Engineer stated that he was two-thirds of the way past the gang when the Senior Track Foreman moved toward the track. The train clipped the Senior Track Foreman as it came to a stop. A witness suggested that the Senior Track Foreman may have been using a cell phone at the time of the impact. The statement from the Engineer noted that the Senior Track Foreman's hands were empty. A check of the Nextel phone assigned to the Senior Track Foreman revealed that no calls were made or received.

The investigation revealed that the Senior Track Foreman was taking care of two gangs, 233 and 241, in addition to the third gang, 242, which included the Junior Foreman. It was revealed that most of the workers in all gangs had less then two years service.

An interview of the Senior Track Foreman's Supervisor revealed no work or personal issues that would hinder the Senior Track Foreman in the performance of his duty.

Findings of FRA post-accident toxicological testing of the Senior Track Foreman and the Engineer operating Train No. 55 were negative.

The investigation revealed that the Long Island Railroad had a compliance testing program. This program (Situational Awareness For Efficient Railroading or SAFER) met the requirements of CFR 49, Part 214.303, which required a procedure to monitor the Roadway Worker Program. Analysis of the data shows the Engineering Department failed to comply with the SAFER Program.

Analysis and Conclusions

The Track Foreman entered the foul area without a return-to-work signal from the Gang Watchman. The foul area was the 4-foot distance from the north rail to the right-of-way clear zone. The signal that is given by the Watchman to resume work and enter the foul zone is the following: The watchman would hold a white disc horizontally at arm's length towards the work site.

The results of the toxicology tests were negative.

Fatigue was not an issue. The Track Foreman was rested before duty. During the previous day, he had attended a Roadway Worker Protection (RWP) training class. Before the training class, the Foreman had been off on a holiday and two rest days.

The Track Foreman was the RWIC. His duties were to give a job briefing, including reading the safety rule of the day, and to determine the sight distance for approaching trains, to allow workers to be clear of the tracks 15 seconds prior to the arrival of a train to the work zone. The Track Foreman, as the RWIC, would have given a job briefing regarding the work to be performed, and the safe clear area to be used, when given the signal by the Watchman to clear. The RWIC would assign the workers to the Watchman positions. The Foreman RWIC was responsible for ensuring all workers understood the job briefing.

The Track Foreman had two gangs under his direct supervision. The majority of the workers in his gangs had less then one year of service. The Track Foreman also was responsible for the on-track safety of the third gang and the four third rail workers, a total of 31 workers.

The Track Foreman was a veteran railroad employee with 21 years of service. It is unknown why he fouled the track area. He may have been preoccupied with the timbers to be installed. The Foreman had been checking the sizes of the new timbers, which were 12 feet long. The old timbers that had been removed were 11 feet long. The sun would have been in his eyes looking east, the direction from which Train No. 55 was approaching. Having seen train No. 34 pass by first on Montauk Track No. 2 may have distracted him from Train No. 55 on Montauk Track No. 1. During the course of interviews, it was discovered that the Foreman had a habit of looking down and observing the track conditions. In the area of impact on the south rail of Montauk Track No. 1, a field weld was discovered and a photo made of the irregular dark area at the bottom of the weld. The irregular weld may have caught his attention. A possible contributing factor was the type of protection used.

The LIRR uses Gang Watchmen for a large majority of track work preformed. A better form of protection would have been an absolute block, holding trains clear of the work zone. Informing train crews of work zones and slowing trains down by work zones would have allowed more time to allow for human error.

APPLICABLE RULES

Long Island Railroad Roadway Worker Protection Manual

Watchmen Signal Roadway Workers must signal that it is safe to resume work as follows: Hold the white disc horizontally at arm's length towards the work site.

Long Island Railroad Safety Rules

Long Island Railroad Safety Rules on or near tracks:

1.10.2(1): Do not walk on, sit on, stand in, or foul tracks except when required to perform your duties.

1.10.2(5): Do not stand on the track in front of an approaching engine, car, or other moving equipment.

49 CFR Part 214 - Roadway Workplace Safety

214.313 Responsibility of Individual Roadway Workers:

Each Roadway Worker is responsible for following the on-track safety rules of the railroad upon which the Roadway Worker is located.

- 1. A Roadway Worker shall not foul a track except when necessary for the performance of duty.
- 2. Each Roadway Worker is responsible to ascertain that on-track safety is being provided before fouling a track.

SUMMARY FOR FE-06-07 SELECTED AND POSSIBLE CONTRIBUTING FACTORS

Railroad: Norfolk Southern Corporation (NS) Location: Piketon, Ohio Region: 2

> Month: March Date: March 12, 2007 Time: 10:59 a.m., EST

Data for Fatally Injured Employee(s)

Track Foreman 51 years old 33 years of service Last rules training: Oct. 12, 2006

Data for All Employees (Craft, Positions, Activity)

Craft: Maintenance of Way

Positions:

SM 14 Surfacing Gang

Track Foreman (also acted as Watchman and operated a hi-rail while traveling to the work site) Regulator Operator Tamper Operator

> Dispatcher Crew of Train 17MLB10

<u>Activity</u>

Surfacing track

EVENT

A Track Foreman was fatally injured when struck by on-track equipment.

SUMMARY FOR FE-06-07 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

<u>PCF No. 1</u>

The fatally injured Track Foreman was fouling the track without on-track safety in effect.

PCF No. 2

The Foreman was unable to function as a Watchman while manipulating the tamper's shadow board apparatus a short time before the incident. Federal regulations and railroad operating rules prohibit Watchmen from performing other activities. Workers occupying the No. 1 track were not notified of the Watchman's change of activity, also in non-compliance with Federal regulations.

<u>PCF No. 3</u>

The Foreman's position while manipulating the shadow board severely restricted his ability to see or hear approaching trains.

<u>PCF No. 4</u>

The location of the switch stand and target between the tracks was atypical, and forced the Foreman to work between the two tracks to manipulate the tamper's shadow board.

PCF No. 4

The sound levels of the tamper exceeded the sound levels of the locomotive's horn.

PCF No. 5

The Track Foreman/Watchman was using individual train detection, which required him to identify approaching trains by the lead locomotive number of the train and communicate this information to the Dispatcher. However, according to the radio log, at no time during their communications, did the Dispatcher or Foreman mention approaching Train 17MLB10, indicating that the train took the Foreman by surprise.

<u>PCF No. 7</u>

Slow orders were not in effect on the adjacent track, increasing the danger for MOW workers. Railroad operating rules required slow orders (25 mph or less) to be issued on adjacent tracks for large-scale operations. The operation on the day of the incident was classified as

SUMMARY FOR FE-06-07 CONTINUED

POSSIBLE CONTRIBUTING FACTORS CONTINUED

PCF No. 7 Continued

small-scale; however, the additional dangers of surfacing work, such as regulators and tampers (with noise levels exceeding the decibel level of the locomotive's horn), and dust limiting visibility, should have been taken into account regarding issuance of a slow order.

REPORT:	FE-06-2007		
RAILROAD:	Norfolk Southern Corporation (NS)		
LOCATION:	Piketon, Ohio		
DATE & TIME:	March 12, 2007; 10:59 a.m., EST		
EVENT ¹ :	A Track Foreman was fatally injured when struck by on-track equipment.		
EMPLOYEE:	Craft:	Maintenance of Way	
	Occupation:	Track Foreman	
	Age:	51	
	Length of Service:	33 years	
	Last Rules Training:	Oct. 12, 2006	

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On March 12, 2007, at 10:03 a.m., the Foreman of the SM 14 Surfacing Gang received an NS 23A authority (exclusive track occupancy) for the No. 1 track between "Vera" (MP N608.5) and "Glen Jean" (MP N634.7) in the Lake Division, Columbus District. The Foreman, in a hi-rail vehicle (HR6064H), and two Machine Operators, of a Kershaw Regulator and a Jackson Tamper, proceeded from the Piketon House Track siding at MP N630.80 east on the No. 1 track to reverse and start surfacing work in a westerly direction near MP N630.0. A regulator, tamper, and hi-rail vehicle, HR6064H, were spaced east to west.

After surfacing about 100 feet of the No. 1 track, the Foreman instructed the Tamper and Regulator Operators to stop work while a westbound train (856LB10) passed their work site on the No. 2 track. After the train passed the work location, the Foreman called the Dispatcher on his radio to ask for foul time on Track No. 2.

The Foreman did not know the number of the lead engine. The Dispatcher instructed the Foreman not to foul the No. 2 Track because an additional train (an M85 with Unit No. 9204) would be approaching. The Foreman responded to the Dispatcher that he understood and would talk to him after the train had passed. However, neither the Foreman nor the Dispatcher were aware that another train, 17MLB10, would be approaching on the No. 2 track (in the same block and west of the M85LB10).

Train 17MLB10 had a lead engine, NS9180, and a trail engine NS9686, and a consist of 70 cars of mixed freight. The Crew of Train 17MLB10 reported to duty at Portsmouth, Ohio at approximately

1

[&]quot;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.

7 a.m. At 10:41 a.m., the train passed a scanner location at MP N617.5 in Lucasville, Ohio, westbound on the No. 2 track in the Lake Division, Columbus District.

Surfacing equipment was extremely noisy, and sight distance was in excess of 1,300 feet in both directions. For a speed of 50 mph, roadway workers must be clear of the track when an approaching train is 15 seconds away, which computes to 1,100 feet. The track was tangent at the accident site (Teays trailing point crossover). Approximately .2 miles east of that point, there was a 2-degree, left-hand curve (as viewed looking toward the increasing milepost and as seen from the operating compartment of westbound trains). Train 17MLB10 was traveling out of this left-hand, 2-degree curve prior to the accident. Approximately .5 miles west of the accident site, there was a right-hand, 2.1-degree curve.

At the time of the incident, the weather was clear, and the temperature was 61° F.

THE ACCIDENT

Just prior to the incident, the Foreman manually raised the shadow board to allow the tamper to move past the switch target and continue tamping. This distraction from his Watchman's duties apparently prevented him from seeing the oncoming train.

Just after the incident occurred, the Foreman was found about 94 feet west of the tamper between the tracks. The Dispatcher immediately called for an ambulance. The policeman who investigated the incident found earplugs near the Foreman's body. He also discovered the Foreman's hard hat about 600 feet west of the tamper and his safety glasses on the front deck of the locomotive.

ACCIDENT INVESTIGATION

Following the incident, NS personnel performed toxicity tests on the Engineer, Conductor, and the deceased. All tests were negative.

During interviews, the train crew members reported that they were within 15-20 car lengths from the tamper when the Foreman, who was facing the tamper from the gauge of the No. 2 track, turned west as the lead engine struck him in the back.

The horn of the lead engine of Train 17MLB10, Unit No. 9180, was tested at the NS Roanoke Locomotive Shop on March 20, 2007. The average reading was 99.6 dbA. The parameters used were 96 to 110 dbA.

On March 13, 2007, decibel test readings were obtained where the employee was struck. This was eight feet from the side of the tamper, with the machines placed at the same point where the accident had occurred, (MP N630.05). When the tamper was operating at high idle, the reading was 106 dbA. When the tamper was operating and engaged in the rail bed, the sound increased to 109 dbA. The regulator was operating about 30 feet from the tamper. The sound level at eight feet from the regulator was 93 dbA. The sound levels emanating from the tamper exceeded the sound levels of the locomotive's horn.

Statements were taken from the Engineer and Conductor of Train 17MLB10, as well as the Operators of the tamper and regulator. The radio conversation recorded between the Colombus District Dispatcher and the SM 14 Surfacing Gang Foreman was obtained. The NS 23A record of track authority for the Surfacing Gang was reviewed, and the event recorder of the lead locomotive NS 9180 was printed and made part of this record.

The Foreman was an experienced employee who was familiar with the territory and held a Foreman's position in excess of five years. The Foreman had one reportable injury during his career, in 1993. He had two rules infractions. Both were verbal warnings for not wearing his hard hat in 1978 and 1982. The Foreman did not work on his rest days (Saturday and Sunday) prior to reporting for duty on March 12, 2007. Fatigue is not considered to be a factor.

A check of the roadway maintenance machines, the Jackson Tamper S/n JT8201SJLN and the Kershaw Regulator S/n BR8503BXN, revealed no exceptions. Both on-track units were vintage machines manufactured prior to January 1, 1991, exempting them from the noise level requirements of 49 CFR 214, Subpart D.

NS on-track safety rules required a train approach warning for trains passing a large-scale work site on an adjacent track when such movements were greater than 25 mph. Train approach warning refers to the requirement that train crew members sound the train horn and locomotive bells when approaching and passing the work area of track gangs working on adjacent tracks. In addition, NS's "Working on or about the tracks" rule requires Machine Operators to stop work and remain seated if the adjacent track is less than 25 feet away, and the speed of the passing train is more than 25 mph; other employees must stop work and stand clear.

At this work site, there were no working limits, and no speed restrictions were in effect on the track adjacent to the occupied track. The NS on-track safety rule concerning train approach warning was fulfilled during the passage of the train prior to the incident. The Tamper and Regulator Operators indicated that the Foreman contacted them by radio or verbally through an open door of the tamper, warning them to stop work before a westbound train, 856LB10, had passed their location. After the train passed, the Foreman additionally warned both Operators not to foul the adjacent track because of additional train traffic. However, for Train 17MLB10, there was no warning to the Operators.

Analysis and Conclusions

The Foreman was at certain times before the incident acting in a Watchman capacity, having warned the Tamper and Regulator Operators of the approaching train (856LB10) on the No. 2 track. The regulation does not prohibit a Watchman from fouling a track in very limited circumstances, such as when a Watchman in close proximity taps another worker on the shoulder to advise him of the approach of a train. This was not the case at this work site. It is also important to note that the RWP regulation prohibits roadway workers from fouling a track unless necessary in the performance of duty.

The conversation between the Dispatcher and the Foreman, after the passing of Train 856LB10, indicates some confusion as to the number of trains that were occupying the 26-mile block between Glen Jean (MP N634.6) and Vera (MP N608.5). The Foreman did not know the number of the lead unit of Train 856LB10, so the Dispatcher asked the Foreman to notify him of the last train he had in the

block, Train M85LB10, with lead engine 9204. At no time, according to the radio log, was there mention of Train 17MLB10 that was involved in the incident.

The Foreman lost all ability to function as a Watchman when he assisted the Tamper Operator by manipulating the tamper's shadow board apparatus a short time before the accident. As such, his position between the two tracks prior to the accident raises the question about an obvious absence of on-track safety for him during that activity. Since he was working with a roadway work group, such an activity could not be performed under the provisions of "individual train detection." Individual train detection refers to the responsibility of the RWIC to identify a specific train by the lead locomotive number of the train; train approach warning refers to the responsibility of the train crew to warn workers on adjacent tracks when approaching or passing workers.

The Foreman's position while manipulating the shadow board severely restricted his ability to see or hear approaching trains. Moreover, this activity was occurring next to the tamper between the tracks with only 13 feet, 6 inches of available track centerline distance.

After performing the shadow board manipulation, as explained earlier, the Foreman occupied the gauge of the No. 2 track, and according to the Tamper Operator, "was spotting him up." No working limits were in place, nor was there any other person providing train approach warning for expected movements on the No. 2 track. The fact that the Foreman was previously notified by the Train Dispatcher, and had acknowledged anticipated train traffic, demonstrates that he most likely lost his situational awareness, or thought he had more time before the next train. The Foreman did not know the engine number of the first train that had passed his location. The Dispatcher did not know which train went by the Foreman, and gave direction to talk after the last train in the block was identified by engine number. These events could have led the Foreman to think there were only two trains in the block (when in actuality there were three) and to believe he had more time between trains than he actually had.

The location of the switch stand and target between the tracks was atypical, and forced the Foreman to work between the two tracks to manipulate the tamper's shadow board.

The work site situation that forced the Foreman to act as a Watchman/Lookout, then attend to other duties, did not comply with railroad operating rules and Federal regulations which stipulated that employees not be assigned other duties while functioning as Watchmen/Lookouts. The workers occupying the No. 1 track were not notified of the Watchman's change of activity, also in non-compliance with Federal regulations.

The difference between large and small scale work groups is also problematic, with respect to defining both groups, and the level of train approach warning used. This work group was defined as a small group by the Tamper and Regulator Operators and the carrier. The Foreman was in charge of a surfacing gang. Defined as large or small, it was a surfacing gang, and as such had the same hazards as all surfacing gangs. This included a high noise environment, limited visibility because of dust, and duties requiring personnel to be near such equipment as tampers and regulators.

In addition, the NS Timetable Number 1, System Instructions No. 752-1, which was in effect June 10, 2002, states the following for large scale production work: "[Regarding] Rail Gangs, Timbering and

Surfacing Gangs, Surfacing Gangs, or Program Ballast Trains,...If the authorized speed on tracks(s) immediately adjacent to MW&S forces is greater than 25 mph, the Chief Dispatcher must arrange for issuance of a 25 mph slow order to be in effect only when passing work limits during a specified time period." Slow orders were not in effect on the adjacent track. The work environment as related to small and large work groups should be addressed by the carrier.

APPLICABLE RULES

Norfolk Southern Corporation

Eastern and Western Regions Timetable No. 1

Rule: 752-1. Large Scale Production Work

When Rail Gangs, Timbering and Surfacing Gangs, Surfacing Gangs, or Program Ballast trains (continuously unloading) are to work on a main track in multiple track territory, the Foreman or Supervisor must contact the Chief Dispatcher at least twelve (12) hours in advance, advising (1) the track to be used by MW & S forces, (2) the date and time work is to be performed, and (3) the work limits (which must begin and end at a specified mile post).

If the authorized speed on track(s) immediately adjacent to MW & S forces is greater than 25 mph, the Chief Dispatcher will arrange for issuance of a 25 mph slow order to be in effect only when passing work limits during a specified time period. Requirements will have been met when the leading end of the train or engine has reached the end of work limits, or when workers have been notified by an MW & S Foreman or a supervisor that the leading end has passed the entire work gang. The engine whistle 14(p) and bell must be sounded when approaching and passing work limits.

Norfolk Southern Operating Rules

Rule 750: Roadway Worker Responsibility

Each roadway worker is responsible for following Roadway Worker Protection safety rules. A roadway worker will not foul a track unless necessary in the performance of duty. Each roadway worker is responsible for ascertaining that on-track safety is provided before fouling track.

Rule 751: Supervisor and Communication

a) When a roadway worker is assigned duties that require fouling a track, he will be provided with a job briefing that includes information on the means by which on-track safety is to be afforded, and instructions on the on-track safety procedures to be followed.

b) A job briefing regarding on-track safety is considered complete after the affected roadway workers have either acknowledged their understanding of the roadway worker protection rules and instructions or have been afforded the opportunity to request explanation of any issues that are not understood.

c) Every roadway work group whose duties require fouling the track will have one roadway worker designated to provide on-track safety for all members of the group. The designated person must be qualified on the rules prescribing protection for each individual in the group. The responsible person may be designated generally, or specifically, for a particular work situation.

d) Before any member of a roadway work group fouls a track, the designated person providing on-track safety for the group will inform each roadway worker of the on-track safety methods to be used and followed during the performance of the work at that time and location. Each roadway worker must again be so informed at any time the on-track safety methods change during the work period. Such information will be given to all roadway workers affected before the change is in effect.

e) A lone worker will communicate at the beginning of each duty period to his supervisor, or in the supervisor's absence, with another employee who has been designated by a supervisory officer, to receive a job briefing and to advise his planned itinerary and the procedures he intends to use for on-track safety. A lone worker called out during off-duty hours, who anticipates that he will have to foul a track, will communicate with the employee who calls him out to arrange a job briefing and to advise his planned itinerary and the rules he intends to use for on-track safety. If this is not possible, the above stated communication must be made with the Dispatcher or other employee in charge of train and engine movements where he expects to be working. An interruption in communication does not prevent a lone worker from starting work; however, the job briefing must be conducted as soon as possible after the beginning of the work period when communications are restored.

RULE 752: Working Limits, General

a) Only a roadway worker who is qualified will establish or have control over working limits for the purpose of establishing on-track safety.

b) No more than one roadway worker will have control over the working limits for the purpose of establishing on-track safety.

c) The movement of trains, engines, and other railroad equipment within limits will be made only under the direction of the roadway worker having control of the working limits. Such movement will be at restricted speed.

d) All affected roadway workers must be notified before working limits are released for the operation of trains, engines, or other railroad equipment. Working limits must not be released until all affected roadway workers have either left the track or have been afforded on-track safety through train approach warning (Watchman/Lookout).

e) Working limits on controlled track must be protected as prescribed by Rule 753, Exclusive Track Occupancy.

f) Working limits on non-controlled track must be protected as prescribed by Rule 755, Inaccessible Track.

RULE 753: Exclusive Track Occupancy

Working limits on controlled track protected through the use of Exclusive Track Occupancy must comply with the following requirements:

a) The authority for Exclusive Track Occupancy, given to the RWIC of the working limits, will be transmitted by the Dispatcher or Control Station via a written or printed document directly, by relay through a designated employee, in a transmission, or by verbal communication.

When authority for Exclusive Track Occupancy is transmitted verbally, the authority must be written on Form 23-A or a track warrant, as received by the RWIC and repeated to the issuing employee for verification.

The RWIC of the working limits must maintain possession of the written or printed authority for Exclusive Track Occupancy until the end of the day following the date entered on the form. The Dispatcher or Control Station must make a written or electronic record of all authorities issued to establish Exclusive Track Occupancy.

b) The extent of working limits established through Exclusive Track Occupancy will be indicated by one or more of the following physical features clearly identified to a Locomotive Engineer or other person operating a train, engine, or other railroad equipment:

- A flag man with instructions and capability to hold all trains, engines, or other railroad equipment clear of the working limits;
- Any station in the timetable that is identified by name with a sign beyond which train movement is prohibited by train movement authority, Rule 808, or track warrant; and/or
- A milepost beyond which train movement is prohibited by train movement authority, Rule 808, track warrant, and/or a fixed definable location such as mileposts, switches, road crossings, and bridges, designated by both name and milepost location, including tenths of a mile, that trains, engines, or other railroad equipment may not pass unless authorized by the Train Dispatcher or Control Station.

RULE 756: Train Approach Warning Provided by Watchmen/Lookouts

Roadway workers in a roadway work group who foul any track outside of working limits will be given warning of approaching trains, engines, or other railroad equipment by one or more Watchmen/Lookouts in accordance with the following provisions: (Note: Train Approach Warning will not be used for protection of on-track equipment or for any track maintenance or construction that would interfere with the safe passage of trains and engines.)

a) Train approach warning must be given in sufficient time to enable each worker to move and occupy a place of safety not less than 15 seconds before a movement operating at maximum authorized speed on that track can pass the location of the roadway worker; b) Watchmen/Lookouts assigned to provide train approach warning must devote full attention to detecting the approach of trains, engines, or other railroad equipment, and communicating a warning thereof, and must not be assigned or perform any other duties while functioning as Watchmen/Lookouts;

d) Every roadway worker who depends upon train approach warning for on-track safety must maintain a position that will enable him to receive a train approach warning communicated by a Watchman/ Lookout at any time while on-track safety is provided by train approach warning;

e) Watchmen/Lookouts will communicate train approach warnings by a means that does not require a warned employee to be looking in any particular direction at the time of the warning, and which can be detected by the warned employee regardless of the noise or distraction of work; and

f) Every Watchman/Lookout will be provided with the equipment necessary for compliance with the ontrack safety duties that the Watchman/Lookout will perform.

RULE 757: On-Track Safety Procedures for Roadway Work Groups

a) No roadway worker who is a member of a roadway work group may foul a track unless on-track safety is provided by the applicable provisions of: Rule 752 (Working Limits Generally); Rule 754 (Train Coordination); or Rule 756 (Train Approach Warning provided by Watchmen/Lookouts).

b) No roadway worker who is a member of a roadway work group may foul a track without having been informed by the roadway worker responsible for the on-track safety of the roadway work group that on-track safety has been provided.

c) Roadway work groups engaged in large-scale maintenance or construction shall be provided with train approach warning, as prescribed in Rule 756, on adjacent tracks that are not included within working limits.

RULE 759: Roadway Worker Visibility

Roadway workers will be provided highly visible apparel that must be worn for the purpose of enhancing detection of their presence by crews of approaching trains and engines, or the Operator of approaching on-track equipment. The engine of an approaching train or engine or the Operator of on-track equipment will acknowledge the presence of roadway workers observed on or near the track by immediately sounding a series of short blasts on the engine whistle or on-track equipment warning device. The audible warning will be prolonged or repeated until the roadway workers acknowledge by radio or hand signal (Rule 12c) that they are aware of the approaching movement.

SUMMARY FOR FE-12-07 SELECTED AND POSSIBLE CONTRIBUTING FACTORS

Railroad: Burlington Northern Santa Fe Corporation (BNSF) Location: Berry, Arizona Region: 7

> Month: July Date: July 8, 2007 Time: 12:30 a.m., PST

Data for Fatally Injured Employee(s)

Conductor 37 years old 10 years, 3 months of service Last rules training: March 29, 2007 Last safety training: March 29, 2007 Last physical: March 11, 2005 Last relevant efficiency test: June 1, 2007

Data for All Employees (Craft, Position, Activity)

Craft: Transportation and Engine

Positions:

Train H-BARTULJ-06A Conductor Locomotive Engineer

Train Dispatcher

<u>Activity</u>

Switching

EVENT

A Conductor was fatally injured when pinned under rolling equipment during a switching operation.

SUMMARY FOR FE-12-07 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

<u>PCF No. 1</u>

Evidence indicated that prior to his fall, the Conductor either had been riding on the platform in the area of the draw bar, in violation of the railroad's operating rules, or crossing from one side to another while the car was moving, possibly to avoid what he perceived as a close clearance ahead. In either scenario, the Conductor failed to maintain three points of contact with the equipment at all times, as required by the railroad's operating rules. (The event recorder data indicated excessive slack action was not a factor.)

<u>PCF No. 2</u>

The Conductor failed to communicate with the Locomotive Engineer about how he was controlling and protecting the movement.

<u>PCF No. 3</u>

No yard lighting was provided at the accident site. Crews depended on available lighting from streets on either side of the track and their hand-held lanterns.

<u>PCF No. 4</u>

While the Conductor had made numerous trips over the five years prior to the incident, he had only made two trips where a set out or pick up was required.

<u>PCF No. 5</u>

Railroad records indicated the Conductor had a pattern of non-compliance with railroad operating rules. He had failed six operational tests. He also failed to comply with numerous operating rules during the July 8, 2007 incident. Examples of two that did not directly contribute to the incident, but adversely affected safety in general were: failure to maintain his signal awareness form (no signal indications were recorded for 51.8 miles, etc.); and failure to apply hand brakes after uncoupling the set-out cars from the train.

<u>PCF No. 6</u>

Railroad management did not provide an adequate response to the failed operational tests. The Conductor was given a verbal debriefing only. No discipline was assessed, nor was any additional training provided.

REPORT:	FE-12-2007		
RAILROAD:	Burlington Northern Santa Fe Corporation (BNSF)		
LOCATION:	Berry, Arizona		
DATE &TIME:	July 8, 2007; 12:30 am., PST		
EVENT ¹ :	A Conductor was fatally injured when pinned under rolling equipment, during a switching operation.		
EMPLOYEE:	Craft:	Transportation and Engine	
	Occupation:	Conductor	
	Age:	37	
	Length of Service:	10 years, 3 months	
	Last Rules Training:	March 29, 2007	
	Last Safety Training:	March 29, 2007	
	Last Physical:	March 11, 2005	
	Last Relevant Efficiency Test:	June 1, 2007	

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On July 7, 2007, a Conductor and Locomotive Engineer were called on duty at Needles, California at 8:45 p.m., PST, to operate eastbound Train H-BARTULJ-06A to Winslow, Arizona. The train had four locomotives with 16 loads and 53 empties for 3,755 trailing tons and was 4,310 feet in length.

The crew boarded the train at the yard office after the inbound crew de-trained. The train departed Needles at 10:05 p.m., July 7, 2007, and the trip was uneventful to Berry. The train was scheduled to make a 9-car set out for a local crew at East Berry, Arizona. East Berry is located at MP 509.2 on BNSF's Seligman Subdivision, Southwest Division.

From the west to the east, the track at the location of the set out point is a .86 percent descending grade and is tangent from MP 513.9, Station Getz, to MP 505, for a total of 8.9 miles. No yard lighting was provided at this location, and crews depended on available lighting from streets on either side of the track and their hand-held lanterns. The train arrived at East Berry at

1

[&]quot;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.

approximately 12:05 a.m., PST, on July 8, 2007. The Engineer reported that the Conductor was awake and aware of his surroundings throughout the duration of the trip.

As the train passed adjacently to the siding on Main Track No. 2, the crew checked to see if the siding was clear of other equipment, the position of switches, and the derail. The Engineer stopped the train short of the main track trailing point switch leading into the yard. The Conductor dismounted the train and noted the derail was applied at the east end of the siding. He then properly lined the derail for movement onto Track 5080, also known as the south siding.

On the south siding from east to west, there were two switches leading from the siding to both an east leg and a west leg of a wye track. The first switch leading to the east leg of the wye was a facing point switch. The second switch leading from the wye to the siding was a trailing point switch. It was normal procedure when setting cars out at Berry to shove cars beyond the switches leading to the east and west legs of the wye track. The procedure ensured that the local freight train working the area had sufficient room for switching operations.

After lining the derail for movement onto the south siding, the Conductor then uncoupled the train between the ninth and tenth head cars. After communicating with the Conductor, the Engineer then operated the train eastward to clear the points of the trailing point switch leading from Main Track No. 2 to the siding. Before initiating the shoving movement, the Engineer enabled the footage counter on the end-of-train (EOT) device located in the cab of the locomotive. He did this to determine distances given by the Conductor and to be able to stop movement of the train if he lost communication with the Conductor. The Conductor gave the Engineer a 50-car count to make a westward shoving movement.

The Engineer asked the Conductor, on the radio, whether he was walking or riding the cut of cars. The Conductor said he was riding the 9-car cut, and the Engineer operated the train proceeding westward at between 8 and 9 mph for the duration of the shoving movement. The Engineer did not know which side of which freight car the Conductor was riding. After the train had shoved about 23 cars, the Engineer slowed the train down, waiting for the Conductor to give another car count. He did this to ascertain a new car count as he hadn't heard from the Conductor since initiating the shoving movement.

The Engineer said the Conductor must have noticed the change in speed, as he called on the radio 25 more cars. The Engineer acknowledged and continued the westward shoving movement. After shoving about 10 cars, the Engineer again began slowing the train, waiting for a new car count. He did not receive a response from the Conductor. When he did not hear from the Conductor, he stopped the movement. He called on the radio for the Conductor and asked him to step away from the train and wave his lantern, so he could determine that the Conductor was okay. The Engineer still did not receive a response. The Engineer then called the Train Dispatcher on the radio and told him he had lost radio communication with the Conductor while making a shoving movement. He said he needed to leave the cab of the locomotive and walk the train to determine if anything had happened to the Conductor.

Prior to the incident, the weather was 88° F, under clear skies with a south wind at 4 mph.

THE ACCIDENT

The Engineer walked along the cut of cars, calling the Conductor's name, but did not receive any acknowledgment. As he neared the west two cars of the cut, he heard the Conductor respond to his calling and located the Conductor pinned under car GABX-158, the eighth head car from the locomotives, which contained a load of coke. His left leg was pinned under the west truck of the freight car. The Engineer made an immediate evaluation of the Conductor's condition and called 911 from his cell phone. He determined there was no bleeding and stayed with the Conductor for a few minutes longer. He then told him he must leave him and go back to the locomotive and use the radio to notify the Train Dispatcher of the incident. The Engineer said as he arrived at the locomotive, he could hear sirens of the emergency vehicles approaching the accident site.

Upon receiving the information about the Conductor, the Train Dispatcher called the Engineer of an approaching westbound train and asked the crew to stop the train adjacently to the accident site to render assistance. The Conductor of Train Q-MEMLAC1-05A, with Locomotive BNSF 5429 West, assisted the injured Conductor before the arrival of the Emergency Medical Technicians (EMTs) and remained until the injured Conductor was transported from the scene.

The Engineer said within five minutes of his phone call to 911, he could hear sirens approaching the scene. The Sheriff's deputies and a fire truck arrived shortly. The ambulance with EMTs passed by the location, trying to find an entrance closer to the accident scene. It is undetermined how much longer it took for the ambulance to arrive, but estimates from interviews noted a delay of between 10 to 20 minutes may have occurred.

Upon arrival, the EMTs began immediate efforts to stabilize the Conductor. To extract the injured Conductor from his position under the freight car, the EMTs had to amputate his leg. The EMTs also determined that the Conductor's right arm was broken between the shoulder and the elbow. He was having difficulty breathing and was given oxygen. However, the first bottle of oxygen was empty, and an EMT was dispatched back to the ambulance to retrieve a second oxygen bottle.

He was then transported to an awaiting Flight-For-Life helicopter at the near-by parking lot of a convenience store. The attending physician and accompanying nurse determined the injured Conductor could not be stabilized enough for transport to a Las Vegas hospital, and he was driven by ambulance to Kingman Regional Medical Center, a distance of approximately eight miles.

The Conductor was stabilized upon arrival at the hospital, removed from the ambulance, and placed in the helicopter for transport to Las Vegas. He expired just as the helicopter took off.

He was pronounced dead at 1:44 a.m., PST, on July 8, 2007. The helicopter returned to the hospital, and the body was removed. The decedent was transported to the Mojave County Medical Examiner's Office in Lake Havasu City, Arizona, where an autopsy was performed.

Findings of the autopsy indicated that the cause of death was multiple blunt force injuries sustained when struck by the moving equipment. The autopsy was performed by the Medical Examiner's office of Mojave County in Lake Havasu City, Arizona. Post-accident toxicological test results for the Engineer and decedent were negative.

POST-ACCIDENT INVESTIGATION

FRA's investigation determined that the Locomotive Engineer of the train lost radio communication with the Conductor and stopped the movement as required by 49 CFR, Part 220.49 and the railroad's operating rules.

It appears the Conductor was riding the lead car of the shoving movement, GABX 118. Either the Conductor crossed over from the north side to the south side of the car while moving or was riding the platform in the area above the draw bar. The Conductor either slipped or lost his balance and fell between the rails and was run over by the equipment.

Following the incident, BNSF inspected the eighth and ninth head cars of the shoving movement. Both cars were found to be in compliance with Federal regulations and without defects.

A review of the event recorder tapes revealed that the Engineer did operate the train at between 8 mph and 9 mph throughout the duration of the shoving movement. The event recorder data indicated nothing that would have caused excessive slack action sufficient enough to cause the Conductor to fall off the equipment he was riding, had he been properly and safely braced.

BNSF tested the portable radio that the Conductor was using for communications to determine if there were any malfunctions. The results indicated that, other than the fact the microphone had been severed from the portable radio when it was dropped by the Conductor, it was a functioning radio.

The investigators noted the following irregularities in the decedent's actions during the trip:

- a. The Conductor failed to maintain his Signal Awareness Form shortly after departure from Needles. No signal indications were recorded for 51.8 miles. No information about the train was recorded on the header of the form, as required by the BNSF operating rule;
- b. After uncoupling the set out cars from the train at East Berry, the Conductor applied no hand brakes to the remainder of the train on Main Track No. 2, which would have been his duty to perform; and
- c. Proper protection of the shoving movement was not established by the Conductor as required by GCOR Rule 6.5.

BNSF investigators noted that, although the Conductor made numerous trips over the past five years between Needles and Winslow, he only made two trips where a set out or pick up was
required. The Conductor was last tested for riding the end of a freight car on Aug. 27, 2003, when he worked on a Kingman, Arizona local train.

The Conductor failed six operational tests during his career. The tests required a verbal debriefing only, and no discipline was assessed.

The Conductor had no reportable injuries during his career with BNSF.

BNSF took immediate action following the fatality and conducted job briefings at all crew change locations throughout the system. In addition, seven of 14 pages of Focus on Safety, a BNSF periodical for employees, were dedicated to addressing the recent fatality at Berry. A check list was provided that covered shoving movements and proper securement of unattended equipment.

Analysis and Conclusion

No one will know for sure where the Conductor was riding the cut of cars, as there were no witnesses to the incident. Evidence at the accident site suggests two possibilities. First, the Conductor may have been riding the north side of the 9-car shoving movement. When the cut of cars was passing the remainder of his train located on Main Track No. 2, he may have thought there was a close clearance and may have crossed over to the south side of the cut of cars. There was an elevation difference of about 18 inches between the south siding and Main Track No. 2 that could haven given the illusion of a close clearance.

The second possibility could be that the Conductor was riding on the metal platform located above or in the area around the draw bar of car GABX 118, the west car of the cut of cars. There was evidence of a foot print on the draw bar, and the imprint matched the pattern on the sole of the Conductor's boot. There was also a smeared foot print adjacent to the clearer footprint, suggesting that his boot might have scuffed the draw bar as he fell.

Additionally, there was evidence that something heavy fell between the rails and markings on the west end of GABX 158, the eighth head car. The evidence was disturbed ballast, indicating a hole where the Conductor's body first hit the ground, and moved ballast between two ties. There were scuff marks on the west end of car GABX 158 and around the draw bar. The distance from the west end of the ninth head car to where the Conductor was found was 61 feet. The location of the hole between the ties was approximately an additional 20 feet. If the Conductor rode either side of car GABX 118, it is unlikely his body would have fallen directly between the rails of the siding track.

APPLICABLE RULES

The Conductor was not in compliance with BNSF Safety Rule S-13.1.5 A, B, when riding equipment. The rule prohibits riding on the crossover platform or end ladder of any freight ear. The rule also requires the employee to maintain three points of contact with the equipment at all times. It is forbidden to ride any part of the coupler apparatus, center sill, end sill, or framework. The rule also states when riding in or on equipment, employees must protect against slack action.

It states when duties require the employee to stand or move about, employees must properly brace themselves and hold on firmly.

The Signal Awareness Form for Train H-BARTUL1-06A was incomplete. The Conductor failed to complete all information required on the header portion of the form that includes his name, the Locomotive Engineer's name, date, train symbol, EOT device number, loads, empties, tons, length, speed, tons per operative brake (TOB), axles, horsepower per ton (HPT), power (locomotives), call time, and departure time. Signals were only completed from Needles, California, to Topock, Arizona, a distance of 14.8 miles. No notations were made on the form from Topock to East Berry, a total of 51.8 miles. This is not in compliance with BNSF System Special Instructions, Item 43.

After cutting away from the train on Main Track No. 2 at East Berry, the Conductor failed to apply hand brakes to the remaining portion of the train. The train was not secured in compliance with Title 49 CFR Part 232.103(n)(1) or with BNSF Air Brake and Train Handling Rules 102.1 and 102.1.2.

The BNSF version of the GCOR requires the person in control of a shoving movement to communicate with the Locomotive Engineer regarding how he is controlling and protecting the movement. This was not communicated properly and is not in compliance with BNSF's GCOR, Rule 6.5 and System Special Instructions.

SUMMARY FOR FE-15-07 SELECTED AND POSSIBLE CONTRIBUTING FACTORS

Railroad: Canadian National Railway (CN) Location: Fulton, Kentucky Region: 3

> Month: July Date: July 27, 2007 Time: 4:25 a.m., CST

Data for Fatally Injured Employee(s)

Conductor 46 years old 5 years of service Last rules training: May 31, 2007 Last safety training: May 31, 2007 Last physical: Jan. 29, 2006 Last relevant efficiency test: March 29, 2007

Data for All Employees (Craft, Positions, Activity)

Craft: Transportation and Engine

Positions:

Road Switcher R90371-26

Locomotive Engineer Conductor Brakeman

Yard Master

Activity

Switching

EVENT

A Conductor was fatally injured when run over by rail cars during a switching operation.

SUMMARY FOR FE-15-07

POSSIBLE CONTRIBUTING FACTORS

<u>PCF No. 1</u>

The cars didn't couple on Track No. 7, site of the fatal incident, because of a closed knuckle on one of the cars, making it necessary for the Conductor to make an adjustment.

PCF No. 2

The Conductor fouled the track between standing equipment to make an adjustment, without making sure a member of his crew was in control of the standing equipment, in violation of railroad operating rules.

PCF No. 3

After reviewing fatigue-related data that the railroad collected on the crew members prior to duty, including a 10-day work history, investigators concluded that fatigue was probable for all three crew members.

REPORT:	FE-15-2007		
RAILROAD:	Canadian National Railway (CN)		
LOCATION:	Fulton, Kentucky		
DATE &TIME:	July 27, 2007; 4:25 a.m., CST		
EVENT ¹ :	A Conductor was fatally injured when run over by rail cars during a switching operation.		
EMPLOYEE:	Craft:	Transportation and Engine	
	Occupation:	Conductor	
	Age:	46 years	
	Length of Service:	5 years	
	Last Rules Training:	May 31, 2007	
	Last Safety Training:	May 31, 2007	
	Last Physical:	Jan. 29, 2006	
	Last Relevant Efficiency Test:	March 29, 2007	

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On July 26, 2007, at 7 p.m., the Crew of Road Switcher R90371-26 went on duty at CN's Fulton Yard in Fulton, Kentucky. The crew consisted of an Engineer, Conductor, and Brakeman. Fulton Yard is the home terminal for all crew members. They were called for this job assignment from various CN extra boards. The Engineer had rested 83 hours, 10 minutes, the Conductor, 17 hours, and the Brakeman, 36 hours, 30 minutes prior to reporting for duty. The crew members had a job briefing with the Fulton Yard Master; gathered their switch lists, daily operating bulletins, and personal protective equipment; and departed the crew room at Fulton Yard. Road Switcher R90371-26 was assigned two locomotives (IC 9574 and GTW 5861), which were left standing on the Fulton lead track by a previous road switcher crew.

The crew mounted the locomotives, and the Engineer went to the cab of Locomotive IC 9574. At about 7:30 p.m., the crew members began switching cars in accordance with their switch list until they were instructed by the Yard Master to break for lunch. They had lunch in the Fulton

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.

crew room and resumed their flat switching operation without incident the morning of July 27. (Flat switching is an older method of switching sometimes used by railroads in industry or smaller rail yards. Switching crew members manually line switches and manually pull the cut lever to separate the cars. In contrast, the most commonly used method is shoving cars to a hump. As the cars roll down grade, they are classified by an operator, inside a tower, who controls the automatic switches and car couplers.)

Fulton Yard is situated on the state line between the states of Tennessee and Kentucky and is geographically positioned north to south. The west lead is located on the west side of the yard, and trains travel northeast to southwest. This lead services Tracks Nos. 1 through 11 and Track No. 19. The east lead is located on the east side of Fulton Yard, and trains travel northwest to southeast. This lead services Tracks Nos. 12 through 18. The switches are clearly identified by switch targets numbered 1 through 14 and 16 through 19, and trains traversing yard tracks operate in an east/west direction.

Fulton Yard is a well-lit facility with tall light poles located throughout the yard, providing better than average lighting conditions after dark. The yard has a north to south descending grade. There is a switchman's shack located at the north end of the west lead track. This is where switching crews receive additional switch lists via a printer, as issued by the **Yard Master**.

At the time of the incident, the temperature was about 76° F, and the wind was blowing mildly west to east. The sky was clear, and visibility was good. The footing conditions in the Fulton Yard were good.

THE ACCIDENT

At about 4 a.m., the crew went onto Track No. 3 with both locomotives and coupled onto 17 cars with the trailing Locomotive GTW 5861. They pulled the 17 cars onto the west lead track and shoved over to the east lead. They used the east lead to place 9 of the 17 cars on Track No. 14 and stretched the slack to ensure the coupling. Road Switcher R90371-26 then returned to the west lead, and the crew had another job briefing. The Conductor and Brakeman decided that the Conductor would ride Car UTLX 74556 on Track No. 7, apply a hand brake to the car, and remain there. They pulled the remaining seven cars onto the west lead and stopped just clear of the switch at Track No. 7, where the Brakeman was standing. He reversed the Track No. 7 switch so that Car IC 581182 could be flat-switched to Track No. 5. He normalized the Track No. 7 switch to flat-switch Car GATX 10818 to Track No. 7. However, unknown to the Brakeman and Engineer, the GATX 10818 failed to couple onto UTLX 74556. The Brakeman reversed the Track No. 7 switch again to flat-switch IC 580593 onto Track No. 5. He then normalized the Track No. 7 switch to flat-switch UTLX 66904 onto Track No. 7. After switching this car onto Track No. 7, the Brakeman reversed the Track No. 7 switch. He then gave the Engineer instructions to couple onto IC 580293 and IC 581182 that were fouling Track No. 6. After making the coupling on Track No. 5, the Engineer and Brakeman said they heard the Conductor say over the radio that he was hurt and needed help.

The Engineer and Brakeman immediately stopped their movement, and the Brakeman headed toward Track No. 7 to locate the Conductor. The Engineer said that he had secured the locomotives and radioed the Yard Master to call 9-1-1. He also radioed the Train Master via the locomotive radio. When he arrived at the accident site, he saw the Conductor lying on the ground face up between the rails. His left arm was severed at the shoulder, and the L1 wheel of Car GATX 10818 was stopped on the Conductor's left shoulder. He also noticed the Conductor's left leg was entangled between the L1 wheel and the car's brake rigging. He and the Brakeman offered reassurances to the Conductor until the ambulance arrived.

The Fulton Train Master, who was at the scene, contacted the CN Fulton mechanical shop personnel and advised them of the situation. After the Carmen arrived at the accident site, they removed the brake rigging from the L1 wheel, which released the Conductor's leg. The Train Master then instructed another CN Engineer to operate locomotives of Road Switcher R90371-26 that were secured on the west lead. The Engineer was instructed to couple onto Cars UTLX 66904 and GATX 10818 and pull them off of the Conductor. After the cars were removed, the Conductor was transported to Parkway Regional Hospital in Fulton, Kentucky, where he expired at 8:24 a.m.

The coroner's report and statements from the Engineer and Brakeman indicate the Conductor received severe blunt force trauma to his upper torso and chest. His left leg was mangled and entangled between the L1 wheel and brake rigging, his pelvis was crushed, and his left arm was severed. These reports also state the Conductor was found face up with the L1 wheel stopped on his left shoulder. These facts place the Conductor in the gage of the rail when he was struck by the moving cars.

POST-ACCIDENT INVESTIGATION

On July 31, the Federal Railroad Administration (FRA) participated in a video re-enactment of the Conductor's fatality. The Tennessee Department of Transportation and CN conducted the reenactment and used the same track, locomotive power, and rail cars involved in the fatality. They re-positioned the GATX 10818 and UTLX 74556 rail cars based on chalk marks previously recorded after the Conductor's body was removed from Track No. 7. Three separate reenactments were performed to ensure accuracy.

During the first re-enactment, Car UTLX 74556 (loaded) was stopped and secured about 300 feet on Track No. 7. This is the same distance the Conductor had placed the car on July 27. Rail Car GATX 10818 (empty car) was flat-switched from the west lead onto Track No. 7. The knuckle was intentionally closed on the "B" end of the car. The CN crew member then rolled the "B" end of UTLX 74556. It did not couple and rolled back about 18 feet. The crew performing the re-enactment then opened the knuckle on GATX 10818 and flat-switched UTLX 66904 on Track No. 7. This car coupled to GATX 10818 and rolled forward 18 feet, coupling onto car UTLX 74556.

The second re-enactment was performed in the exact same manner, except that UTLX 74556 moved east about six feet on impact. The third re-enactment yielded identical results as the first.

The employee interviews and FRA investigation findings indicate that the L1 wheel of GATX 10818 rolled over the Conductor.

Analysis and Conclusion

It has been established that all crew members had adequate communication, and their radios were functioning properly. FRA investigators concluded that the crew members' personal protective equipment was adequate and did not play a part in the fatality.

FRA post-accident toxicological testing was performed on all crew members, and the results were negative.

The CN training records of the crew members indicate they were experienced and qualified on all assignments in Fulton Yard, including road switcher and yard assignments. The crew members' efficiency tests and observation records conducted by CN officials indicated no violations.

CN uses the LIFE Safety Booklet which states in Section II, paragraph 17, "Look for moving equipment when approaching, crossing, or fouling tracks." Paragraph 18 states "Expect and keep clear of the movement of trains, engines, cars, or other equipment at any time, on any track, in any direction." Paragraph 20 states "Do not cross within 25 feet of standing equipment unless you or a member of your crew is in control of the standing equipment." Also, T-11 of the LIFE Safety Booklet states in paragraph 2, "Do not cross tracks immediately in front of moving equipment." CN Operating Rule 604 states "Kicking or Dropping Cars is permitted only when it will not endanger employees, equipment, or contents of cars. Before dropping cars, crew members must fully understand the intended movement. They must verify...".

Evidence indicates that the cars didn't couple on Track No. 7 and that the Conductor went to Car GATX 10818 to either adjust the draw bar or open the knuckle. While making this move, the Conductor was impacted by the moving rail cars.

FRA investigators obtained fatigue related information, including a 10-day work history, for the three CN employees involved in this fatality, i.e. the Engineer, Brakeman, and Conductor of Road Switcher R90371-26. If the employee did not provide sleep information, the default setting of Excellent was used. Based on the data listed below, FRA concluded fatigue was probable for the employees of Road Switcher R90371-26. Specific data follow:

Locomotive Engineer assigned to Train R90371-26:

Sleep setting (Excellent, Good, Fair, or Poor) = Excellent Overall effectiveness = 68% Lapse Index = 5.6 Reaction Time = 146 Chronic Sleep Debt = 7.69 Hours of Continuous Wakefulness = 22.43 Time of Day (military): 04:25 BAC Equivalent > 0.08 Conclusion: Fatigue was probable for this employee.

Conductor assigned to Train R90371-26 (Deceased):

Sleep setting (Excellent, Good, Fair, or Poor) = Excellent Overall effectiveness = 66% Lapse Index = 6.1 Reaction Time = 151 Chronic Sleep Debt = 8.17 Hours of Continuous Wakefulness = 17.93 Time of Day (military): 04:25 BAC Equivalent > 0.08

Conclusion: Fatigue was probable for this employee.

Brakemen assigned to Train R90371-26:

Sleep setting (Excellent, Good, Fair, or Poor) = Excellent Overall effectiveness = 64% Lapse Index = 6.6 Reaction Time = 155 Chronic Sleep Debt = 9.47 Hours of Continuous Wakefulness = 22.43 Time of Day (military): 04:25 BAC Equivalent > 0.08

Conclusion: Fatigue was probable for this employee.

APPLICABLE RULES

LIFE - CN U. S. Region Second Edition Effective - March 2005

Section II

Page 3, Paragraph 17: Look for moving equipment when approaching, crossing, or fouling tracks.

Paragraph 18: Expect and keep clear of the movement of trains, engines, cars, or other equipment at any time, on any track, in any direction.

Paragraph 20: Do not cross within 25 feet of standing equipment unless you or a member of your crew is in control of the standing equipment.

Page 6, Subpart 1.a.I of Rule T-2, Coupling and Uncoupling: State via radio, "Going between, [insert required identification (engine initials and number)]."

U. S. Operating Rules Third Edition Effective 1200 Sunday, Oct. 30, 2005

604. KICKING OR DROPPING CARS: Kicking or dropping cars is permitted only when it will not endanger employees, equipment, or contents of cars.

CN Central Division Timetable Effective 1200 Central Continental Time Sunday, Jan. 28, 2007

OPERATING CHARACTERISTICS DOB LIMITS -Fulton Terminal DOB

Bluford Sub between MP 40.1 and MP 40.7 Cairo Sub between MP 402 and MP 405.4 Fulton Sub between MP 40.7 and MP 273

<u>SUMMARY FOR FE-16-07</u> SELECTED AND POSSIBLE CONTRIBUTING FACTORS

Railroad: Burlington Northern Santa Fe Corporation (BNSF) Location: Rozet, Wyoming Region: 8

> Month: August Date: Aug. 2, 2007 Time: 11:45 a.m., MST

Data for Fatally Injured Employee(s)

Crane Operator 59 years old 14 years, 10 months of service Last rules training: March 23, 2006 Last safety training: March 23, 2006 Last relevant efficiency test: July 25, 2007

Data for All Employees (Craft, Positions, Activity)

Craft: Maintenance of Way

Positions:

BNSF Structure Crew

Two Foremen Eight Laborers Leads Man (one of Laborers)

American Crane Operator

Dispatcher

<u>Activity</u>

Bridge Construction

EVENT

A Crane Operator was fatally injured, during bridge construction, when the crane he was operating toppled over and hit the ground.

SUMMARY FOR FE-16-07 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

<u>PCF No. 1</u>

The Crane Operator did not adjust the angle of the boom prior to or during the rotation of the crane. As the crane was rotating, it tipped over when the boom was extended to approximately a 90-degree angle to the track.

PCF No. 2

The Crane Operator failed to comply with BNSF's pile driving instructions regarding crane boom weight, angle, and radius.

PCF No. 3

While the other workers lodged at a motel in Gillette during their work week, the Crane Operator commuted 35 miles each way daily, in addition to working 10 to 12-hour shifts. This gave him less time to rest than the others.

REPORT:	FE-16-2007		
RAILROAD:	Burlington Northern Santa Fe Corporation (BNSF)		
LOCATION:	Rozet, Wyoming		
DATE & TIME:	Aug. 2, 2007, 11:45 a.m., MST		
EVENT ¹ :	A Crane Operator was fatally injured, during bridge construction, when the crane he was operating toppled over and hit the ground.		
EMPLOYEE:	Craft:	Maintenance of Way	
	Occupation:	Crane Operator (Structures Department)	
	Age:	59 years	
	Length of Service:	14 years, 10 months	
	Last Rules Training:	March 23, 2006	
	Last Safety Training:	March 23, 2006	
	Last Physical:	Unknown	
	Last Relevant Efficiency Test:	July 25, 2007	

CIRCUMSTANCES PRIOR TO THE ACCIDENT

At 7 a.m., MST, on Aug. 2, 2007, a BNSF structure crew reported for duty at BNSF headquarters in Gillette, Wyoming. The crew consisted of one Foreman and four Laborers from Scottsbluff, Nebraska, and one Foreman and four Laborers from Guernsey, Wyoming. After receiving a job briefing, they traveled, via BNSF trucks, to the job site, which was a bridge located at milepost 575.9 on the BNSF Powder River Division, Black Hills Subdivision. The crew was assigned to drive steel "H" piling by use of a crane at Bridge No. 575.99 on Main Track No. 2. Steel "H" piling is a component of a bridge used to support other components of a bridge. It is also the bottom most component of a bridge.

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.

Also at 7 a.m., on Aug. 2, 2007, a BNSF American Crane Operator reported for work at a spur track at milepost 581.8 at the Black Hills Subdivision. This is the location where the Operator left the on-track crane the day before. He waited at that location until one of the Structures Gang Foremen obtained Track and Time Authority from the BNSF Dispatcher for the crane and members of the crews to occupy Main Track No. 2 within specified milepost and time limits.

At 8:16 a.m., after being notified that authority to occupy Main Track No. 2 had been received from the Train Dispatcher, the Operator boarded the American Crane, departed the spur track at milepost 581.8, and operated the crane to the work location at milepost 575.9.

The method of operation for trains in the Black Hills Subdivision is a Traffic Control System. Track and Time is used by the engineering department for authority to occupy the main track. In the area of the incident, there were two main tracks. The grade in the accident area was .4 percent descending, both per timetable and geographically eastward. The track section was tangent.

After arriving at the work site at milepost 575.9 on Main Track No. 2, all members of the crew, including the Operator of the crane, received a job briefing. The Crane Operator then began to prepare the crane for driving steel piling at the bridge. Two members of the crew assisted the Operator while the remaining crew members prepared the bridge for the pile driving operation.

At the time of the incident, it was cloudy, and the temperature was 84° F.

THE ACCIDENT

A Laborer called the "Leads Man" was assigned to direct the Crane Operator, via hand signals or radio communications, on the moves to make during the pile driving operation.

When the piling was driven the proper depth into the ground, the excess steel piling was cut off with the use of an acetylene torch. The excess was then taken to the east approach of the bridge, by the crane, and lowered onto the shoulder of the track on the south side. The piling that was cut off was approximately 14 feet in length and weighed approximately 1,246 pounds. When the cut-off piece of piling was lowered by the crane onto the shoulder of the track, the crane was facing westward.

After the piling cutoff had been set on the shoulder of the track, the Laborers assisting the Crane Operator secured (rolled up) three different ropes and/or cables that are used to secure the piling and hung them at the bottom of the pile driver.

The crane was then rotated 180 degrees (to the east), which would be the direction the crane would be facing during the next pile diving operation. When the rotating crane boom reached a 90-degree angle to the track, it tipped and rolled off the track. The crane came to rest on the

south shoulder of the main track. The Crane Operator was pinned in the cab of the crane and was killed due to crushing injuries sustained when the crane cab hit the ground.

An autopsy was performed on the Crane Operator, but the findings were not made available. The County Coroner was served a subpoena requiring that a copy of the autopsy report be provided to FRA.

POST-ACCIDENT INVESTIGATION

The crew was working four 10-hour days, Monday through Thursday. The Crane Operator worked the same hours as the crew, but would occasionally work an hour or two overtime to prepare the crane for the next day's work. The crew members lodged at a motel in Gillette during their work week. The Crane Operator stayed in a camper near Newcastle, Wyoming, and traveled to the crane tie-up location each day, which is approximately 35 miles.

Interviews conducted with various members of the crew indicated events during the day of the incident had been routine up to the time of the incident. Two of the crew members witnessed the incident. They said the Crane Operator did not adjust the angle of the boom prior to or during the rotation of the crane. As the crane was rotating, it tipped over when the boom was extended to approximately a 90-degree angle to the track. The remaining crew members were on or beneath the bridge preparing for the next pile to be driven and did not witness the incident.

At the time of the incident, the crane boom carried the driving hammer, lead column, and kicker used for the piling driving operation. The total weight of these components was approximately 32,318 pounds. There was no additional load attached to the crane boom as the tip-over occurred. However, evidence indicates the pile driver hammer may have been higher on the boom than necessary when rotating the equipment, which made the boom top heavy. It is unknown why the pile driver hammer was in this position, but to make a safe rotation, it should not have been.

Analysis and Conclusion

On April 11, 2003, BNSF issued Interim Instructions concerning limitations on the operation of American Crane BN975502 (locomotive crane/pile driver). This is the crane involved in this incident. Line item no. 4 states, "The machine may be rotated 180 degrees without a pile in the leads if the leads are vertical at a crane radius not to exceed 25 feet." At the time of the incident there was no piling in the crane's boom lead, but the Operator had the boom radius at 30 to 31 feet.

Cross referencing this 25-ft. radius with the Rated Load Capacity Chart for BN975502, the maximum weight for rotating is 39,000 pounds. Page 2 of 2 from BNSF's Structures Pile Driving Instructions indicate the individual weight of all components of the Berminghammer Vertical Travel Lead (VTL) System. The total weight of all components attached to the crane's boom at the time of the incident was 32, 318 pounds. Crane BN975502 was equipped with the VTL system. BNSF Crane Operators are allowed to either use the load radius (feet) or boom

angle (degrees) when rotating their crane when equipped with a pile driver. A boom angle of 71 degrees corresponds to the load radius of 25 ft. This weight difference of 6,782 pounds (39,000 minus 32,218) allows for a 20 percent margin of error in Operator calculations when rotating the crane equipped with the pile driver.

The Crane Operator exceeded the load radius footage as cited in the Interim Instructions dated April 11, 2003. The Crane Operator also did not comply with the Rated Load Capacity Chart for Locomotive Crane BN975502 when attempting to rotate a load of 32,318 pounds.

None of the employees from the crew saw the Crane Operator adjust the angle of the boom prior to or during the rotation of the crane.

In summary, the Crane Operator failed to comply with BNSF's pile driving instructions regarding crane boom weight, angle, and radius.

The incident met the requirements for FRA Post-Accident Testing as required under CFR, Part 219, Subpart C, for the deceased. The results were negative.

<u>SUMMARY OF FE-18-07</u> SELECTED AND POSSIBLE CONTRIBUTING FACTORS

Railroad: Indiana Harbor Belt Railroad Company (IHB) Location: East Chicago, Indiana Region: 4

> Month: August Date: Aug. 25, 2007 Time: 5:23 a.m., CST

Data for Fatally Injured Employee(s)

Yard Conductor 43 years old 4¹/₂ years of service (Transportation) 3 years of service (Mechanical) Last rules training: July 16, 2007 Last safety training: July 16, 2007 Last physical: May 12, 2006 Last relevant efficiency test: July 30, 2007

Data for All Employees (Craft, Positions, Activity)

Craft: Transportation and Engine

Positions:

Yard Assignment Run 138 Locomotive Engineer Conductor

Yard Master

Activity

Switching

EVENT

A Conductor was struck by moving rail equipment, while either crossing in front of or falling from it, during a switching operation.

SUMMARY FOR FE-18-07

POSSIBLE CONTRIBUTING FACTORS

<u>PCF No. 1</u>

Due to the curvature of the tracks, the Engineer could not see the Conductor.

PCF No. 2

The Locomotive Engineer and Conductor failed to comply with railroad operating rules and Federal regulations regarding radio communications, by failing to provide required and critical information, acknowledgments, and identifications.

PCF No. 3

Just prior to the fatal incident, the Engineer failed to stop the shoving movement within one half the specified distance.

PCF No. 4

It was dark and raining, restricting the Conductor's visibility. Shortly before the incident, the Conductor had to obtain paper towels to wipe the rain off of his safety glasses.

PCF No. 5

Investigators determined, from the results of fatigue analysis, that fatigue was probable for both the Conductor and Locomotive Engineer.

REPORT:	FE-18-2007		
RAILROAD:	Indiana Harbor Belt Railroad Company (1HB)		
LOCATION:	East Chicago, Indiana		
DATE &TIME:	Aug. 25, 2007; 5:23 a.m., CST		
EVENT ¹ :	A Conductor was struck by moving rail equipment, while either crossing in front of or falling from it, during a switching operation.		
EMPLOYEE:	Craft:	Transportation and Engine	
	Occupation:	Yard Conductor	
	Age:	43	
	Length of Service:	4 ½ years (Transportation) 3 years (Mechanical)	
	Last Rules Training:	July 16, 2007	
	Last Safety Training:	July 16, 2007	
	Last Physical:	May 12, 2006	
	Last Relevant Efficiency Test:	July 30, 2007	

CIRCUMSTANCES PRIOR TO THE ACCIDENT

At 11:59 p.m., CST., on Aug. 24, 2007, an Indiana Harbor Belt Railroad (IHB) crew, comprising a Conductor and a certified Locomotive Engineer, reported for work at IHB's Michigan Avenue Yard in East Chicago, Indiana, for Yard Assignment Run 138. Both crew members of Run 138 had received the required statutory off-duty period before reporting for this assignment. The Conductor had been off duty the previous two days on assigned rest days. Both employees were familiar with the yard and worked there regularly.

Michigan Avenue Yard lies geographically in a north-south direction. The timetable refers to the north end of the yard as the east end. All future references to direction in this report will refer to the geographical direction. The yard lies immediately to the east of two main tracks, and was virtually level in the accident area. The yard consists of 26 tracks, beginning with track 00 on the west, and numbered

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.

00 through 25 in ascending order to the east. Track 25, the yard lead, was bordered on the east side by an unpaved access road.

The access road was bordered on the east by a security fence which separates the IHB property from a private industry. There are several floodlights, spaced approximately 160 feet apart, and mounted approximately 25 feet above the ground. These lights, controlled by photocell, face the IHB property and provide illumination in the vicinity where the incident occurred. After going on duty, the two men received a job briefing from the Yard Master before commencing switching operations.

The walking surface in the vicinity of the incident was unpaved, but was smooth and relatively level. The ground was wet, but the footing was good in all other respects. The wind was out of the south at 4 mph, and the temperature was 70° F. It had been raining intermittently throughout the night and was raining at the time of the incident.

THE ACCIDENT

The crew of Run 138 was "flat-switching" freight cars at the south end of the Michigan Avenue Yard at the time of the incident. "Flat Switching" is a term used to describe the classification of railroad rolling stock done at other than a hump yard area and is a common practice in the railroad industry. It refers to the pulling or shoving of railroad rolling stock, on relatively flat terrain, into or out of appropriate tracks, by use of a locomotive.

During this process, the locomotive was coupled to the south end of the rail freight cars and facing north. The Engineer was seated at the controls in the control compartment on the east side of the locomotive. The Conductor was at the north end of the cars, where he could couple and uncouple the cars and line switches for the various tracks. Due to the curvature of the tracks, the Engineer could not see the Conductor. The two men were communicating by radio.

At one point during the switching operations, shortly after 5 a.m., the Conductor walked to the locomotive, and while standing beside the locomotive, asked the Engineer to hand him some paper towels. The Engineer complied, then watched as the Conductor used the towels to wipe the rain off of his glasses and forehead. The Conductor then returned to the other end of the cars, and the two men resumed work. This was the last time the Engineer saw the Conductor before the incident.

At 5:21 a.m., the crew was in the process of moving 13 cars from Track No. 17 to Track No. 21. After coupling the engine to the south car on Track No. 17, the Conductor instructed the Engineer to pull the cars south from Track No. 17 to the yard lead. When the last car cleared the switch, the Conductor instructed the Engineer to stop. The Conductor then lined the switch, which was located on the east side of the lead, so that the cars could be shoved north toward Track No. 21. It was believed the Conductor then walked north along the east side of the yard lead toward Track No. 21 where he could control the movement by radio.

The Conductor then instructed the Engineer to shove the cars six or seven car lengths, to couple to four cars that were already on Track No. 21. The Engineer began shoving the cars as instructed. After moving about three car lengths, the Engineer tried, as required by Federal regulation and railroad

operating rules, to contact the Conductor by radio for further instructions. When the Conductor failed to respond, the Engineer brought the movement to a stop. He then made three more attempts to contact the Conductor by radio.

The Engineer then dismounted the locomotive and walked towards the lead car to look for the Conductor. As he approached the lead car, the Engineer saw the Conductor lying across the west rail beneath the front (north) set of trucks of the second car they had been shoving. The Engineer used his cell phone to contact the Yard Master, who called emergency responders and notified company officers. In addition to company officers, responders included the IHB police, the East Chicago police, and the Coroner for Lake County, Indiana. The Coroner pronounced the employee dead at 7:10 a.m.

POST-ACCIDENT INVESTIGATION

By the time FRA had been notified and had arrived at the scene, the employee's remains had been removed, at the direction of the Coroner. Consistent with the requirements of the emergency responders, the IHB attempted to preserve the accident scene. To facilitate removal of the body, the cars were pulled to the south for approximately one car length. A reference mark was made to document the body location before it was removed. Prior to FRA's arrival, the cars had been returned to their original position.

FRA examined the scene and took photographs and measurements. FRA inquired about the floodlights on the east side of the yard, but it could not be confirmed whether they were illuminated at the time of the incident. The incident occurred shortly before dawn.

FRA also reviewed a recording, furnished by the railroad, of radio communications that took place before, during, and after the time of the incident. The radio transmissions indicate the Conductor was controlling the movement by radio and was aware the cars were moving in his direction, as he had instructed the Engineer to "shove six or seven (car lengths) to a (coupling)."

FRA noted non-compliance with several operating rules and Federal regulations regarding radio communications. For example, in non-compliance with 49 CFR Part 220.49, the Conductor failed to state the precise distance to shove the cars, e.g. "138, shove six or seven (car lengths) to a (coupling);" the Engineer failed to acknowledge the Conductor's instructions before beginning the shoving movement; and the Engineer failed to stop the movement within one half the specified distance. In non-compliance with 49 CFR Part 220.27, the Engineer also failed to use proper identification when attempting to contact the missing Conductor, calling the Conductor by name, e.g. "Still with me, Henry?" Furthermore, there was an unidentified transmission from someone, presumably the Yard Master, to the Engineer, inquiring about the missing Conductor.

The Coroner conducted a post-accident toxicological test of the deceased. The Engineer cooperated in post-accident toxicological testing, which was conducted at a local medical facility. FRA's Alcohol and Drug Program manager reported the results of toxicological testing of both employees as negative. The results of an autopsy were pending at the time of this report.

The Engineer made a written statement to the IHB about the incident. He was then released from duty and did not return to work until Sept. 17, 2007.

According to information obtained from the IHB railroad police and East Chicago police reports, the Conductor's body was found 153 feet north of the switch for Track No. 17. He was lying on his back across the west rail, between the first and second leading wheels of the second car from the leading end. He had been severed at the waist by the wheels. His head and upper torso were lying to the west, and his lower body was in the gage between the rails. Although there were no eyewitnesses to the incident, it is believed the Conductor crossed the yard lead immediately after he lined the switch, and either walked toward Track No. 21, or boarded the leading car before the movement began.

At the time of the fatal incident, the Conductor was wearing his baseball cap, work shirt, work pants, and the required personal protective equipment (PPE). The PPE included safety glasses with side shields, work gloves, and work boots. His lighted lantern was lying near his outstretched left hand. The bail of the lantern was turned to one side.

FRA also examined the Conductor's boots and determined them to be in good condition. There was no build-up of mud or other substance on the soles of the boots, and there were no marks on the sides of the boots to indicate that he had been rolled over or dragged. FRA examined the foot path on the switching lead and determined that it was unpaved, but was smooth and relatively level. No significant slipping or tripping hazards were noted.

The Conductor was wearing a portable radio on his right hip with a speaker microphone attached to a "break-away" cord which he was wearing around his neck. FRA examined the radio, noting that the edge of the center section of the radio antenna had been crushed.

It was dark and raining around the time of the incident. FRA determined this by examining weather observations which were recorded at an interlocking tower less than one mile from the accident scene. A few minutes before the incident, the Conductor walked back to the locomotive to get some paper towels, which he used to wipe his glasses before resuming work.

The railroad inspected the rolling equipment involved in the incident and took no exceptions. An FRA Operating Practices Inspector also inspected the rolling equipment, including handholds and sill steps, and took no exceptions.

According to the IHB's review of the locomotive event recorder data, the distance traveled during this movement was 288 feet from where it began. FRA's review of the same event recorder data determined that the actual distance traveled was 276 feet for the beginning point. This was 12 feet less than the distance represented by the IHB review. The IHB review used the incorrect stop time when determining the time at which the locomotive changed direction of operation.

Run 138 was handling 13 cars during the shove movement, and each car had a length of 52 feet, not including the coupler. The Conductor instructed the Engineer to move seven car lengths or about 364 feet; one-half that distance would be 182 feet. With the actual distance of travel set at 276 feet, the Engineer, in order to comply with Federal regulations, should have stopped the movement after moving

about $3\frac{1}{2}$ car lengths or 182 feet. In this instance the Engineer continued the movement for an additional 94 feet or about $1\frac{1}{2}$ car lengths beyond the point where the stop should have been made.

FRA's review also showed that the locomotive throttle position during the shove had reached throttle no. 6 and the speed had reached 6 mph before the Engineer rapidly reduced the throttle position to zero. Additionally, FRA's review showed the Engineer applied no braking effort by use of the train or locomotive air brake until after the movement had stopped, yet the speed reduced from 5 mph to 0 mph in four seconds while traveling eight feet. Although no hand brakes were found applied on the equipment when inspected following the incident, FRA believes either the air brakes were applied on some of the cars or there were hand brakes applied to some of the cars during the shove movement.

Analysis and Conclusions

FRA noted the following non-compliance with Federal regulations and railroad radio rules: The Conductor failed to state the precise distance to shove the cars; the Engineer failed to acknowledge the Conductor's instruction before beginning the shoving movement; based on the distance moved during the shove, the Engineer failed to stop the movement within one half the distance specified by the Conductor; the Engineer failed to use proper identification when attempting to contact the missing Conductor; and an unidentified transmission occurred, presumably the Yard Master to the Engineer on Run 138.

The weather may have been a contributing factor as evidenced by the Conductor's actions shortly before the incident. He had made an extra trip to the locomotive to get paper towels, to wipe the rain off of his safety glasses.

No significant slipping or tripping hazards were noted: the Conductor was properly attired for the job; his boots were in good condition, and the soles were free of any slippery substance; he was carrying a lighted lantern; and the footpath on the switching lead was unpaved, but was smooth and relatively level.

At the time of the incident, both employees had been on duty less than 5 ½ hours. Both employees received the required statutory off-duty period, with the Conductor having been off for the previous two days on assigned rest days.

Records obtained from the railroad indicated both employees had passed the required physical examinations. They also had received training in rules and regulations related to the proper performance of their duties and had passed the required written examinations and efficiency tests.

Both employees worked in this yard on a regular basis and were familiar with the area where the incident occurred. They were working in an isolated area of the yard, but there were no distractions which might have caused a loss of situational awareness.

A job briefing form confirmed that both employees had received a job briefing at the beginning of their tour of duty. Additional job briefings were conducted as the work progressed.

The equipment involved was inspected by FRA and railroad investigators after the incident. No exceptions were taken to the equipment, and no tests were conducted on the equipment.

The results of toxicological testing of both employees were negative.

FRA uses an overall effectiveness rate of 77.5 percent as the baseline for fatigue analysis, which is equivalent to a blood alcohol content (BAC) of 0.05. At or above this baseline, fatigue is not considered as probable for any employee. Software sleep settings vary according to information obtained from each employee. If an employee does not provide sleep information, FRA uses the default software settings.

FRA obtained fatigue-related information, including a 10-day work history, for the Locomotive Engineer and the Conductor of Run 138. FRA concluded fatigue was probable for both employees. Results of the fatigue analysis follow:

Conductor assigned to Run 138:

Sleep setting = Excellent Overall effectiveness = 60.3% Lapse Index = 7.8 Reaction Time = 166 Chronic Sleep Debt = 9.9 Hours of Continuous Wakefulness = 23.4 Time of Day (military): 05:23 BAC Equivalent > 0.08

Conclusion: Fatigue was probable for this employee.

Locomotive Engineer assigned to Run 138:

Sleep setting = Excellent Overall effectiveness = 63.32% Lapse Index = 6.9 Reaction Time = 158 Chronic Sleep Debt = 8.93 Hours of Continuous Wakefulness = 23.4 Time of Day (military): 05:23 BAC Equivalent > 0.08

Conclusion: Fatigue was probable for this employee.

Based upon the prevailing weather and the Conductor's earlier effort to wipe the rain from his glasses, it is believed the Conductor's vision may have been impaired by the rain and possible fogging of his glasses. It is unknown whether or not the Conductor crossed from the east side to the west side of the equipment after aligning the switch from Track No. 17.

FRA could reasonably make the conclusion that because of the extremely short distance traveled after the locomotive throttle was placed in idle, if any air or hand brakes were applied to the cars, the Conductor may have been attempting to release those brakes at the time of the incident. The position of the body indicated he either crossed in front of the equipment, or boarded the equipment and fell, resulting in his being run over. In conclusion, the Conductor either walked, slipped, or fell in front of the movement he was controlling, resulting in a fatality.

SUMMARY FOR FE-19-07 SELECTED AND POSSIBLE CONTRIBUTING FACTORS

Railroad: Burlington Northern Santa Fe Corporation (BNSF) Location: Stockton, California Region: 7

> Month: August Date: Aug. 30, 2007 Time: 5 a.m., PST

Data for Fatally Injured Employee(s)

Yard Helper 50 years old 2 years, 4 months of service Last rules training: July 8, 2005 Last physical: Feb. 28, 2005 Last relevant efficiency test: June 1, 2007

Data for All Employees (Craft, Positions, Activity)

Craft: Transportation and Engine

Positions:

Switch Crew of Mormon Yard Assignment YSTO3O1-29A Foreman Yard Helper

Train Master

Crew of Road Switcher R-CALOO38-291 Engineer Conductor Brakeman

<u>Activity</u>

Remote control switching operation

SUMMARY FOR FE-19-07 CONTINUED

SELECTED FACTORS CONTINUED

EVENT

A Yard Helper was fatally injured during a remote control switching operation when he fell from the hopper car he was riding, as it collided with a standing tank car that was fouling the crossover.

POSSIBLE CONTRIBUTING FACTORS

<u>PCF No. 1</u>

Prior to the collision, the Train Master and Foreman failed to advise the Yard Helper (who was riding the lead hopper car) about the cars fouling the crossover track.

PCF No. 2

Although there were flood lights positioned at specific locations throughout Mormon Yard, the lighting at the accident site was dim, causing poor visibility.

PCF No. 3

In non-compliance with railroad operating rules, the Conductor failed to move the standing cars clear of the crossover. Instead, he asked the Train Master if it was acceptable to leave cars in a fouling position.

<u>PCF No. 4</u>

When the Conductor advised the Train Master of the cars left foul at the crossover, the Train Master failed to instruct the crew to move the cars clear of the crossover. He also failed to warn the Yard Job Crew of the hazard.

<u>PCF No. 5</u>

The Foreman did not comply with railroad operating rules, requiring that he carry a lantern when lining switches and conducting other activities in the dark. This may have prevented him from seeing the cars fouling the crossover track.

REPORT:	FE-19-07		
RAILROAD:	Burlington Northern Santa Fe Corporation (BNSF)		
LOCATION:	Stockton, California		
DATE & TIME:	Aug. 30, 2007; 5 a.m., PST		
EVENT ¹ :	A Yard Helper was fatally injured during a remote control switching operation when he fell from the hopper car he was riding, as it collided with a standing tank car that was fouling the crossover.		
EMPLOYEE:	Craft:	Transportation and Engine	
	Occupation:	Yard Helper	
	Age:	50	
	Length of Service:	2 years, 4 months	
	Last Rules Training:	July 8, 2005	
	Last Physical:	Feb. 28, 2005	
	Last Relevant Efficiency Test:	June 1, 2007	

CIRCUMSTANCES PRIOR TO THE ACCIDENT

At 11 p.m., PST, on Aug. 29, 2007, the Switch Crew of BNSF Mormon Yard Assignment YSTO3O1-29A reported for duty. The crew consisted of a Foreman and Yard Helper assigned to operate locomotive BNSF 2810 in a Remote Control Operation (RCO). Both crew members reported for duty after having the required statutory, off-duty period. According to statements made by employees, a job briefing was held between crew members and the Train Master at the beginning of the shift. Once the yard crew members started work, their first move was to take the locomotive to the east end of Mormon Yard and establish a Remote Control Zone by way of Yard Track No. 132. As the crew members proceeded east along Track No. 132, they came upon standing equipment that had been left on the track, which required them to return to the middle of the yard. Then, a crossover movement was made in order to use Track No. 133 as a means to get to the east end of the yard.

Upon arriving at the east end of the yard, the crew members proceeded to establish a Remote Control Zone in the east yard lead by inspecting the lead track to ensure no other movements

1

[&]quot;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.

were occurring, and then placing a derail switch at the east end of the lead track into the derailing position before starting their work.

At approximately 1:30 a.m., a westbound Road Switcher R-CALOO38-291 arrived from Riverbank, California on Main Track No. 2. The Road Switcher had instructions to set out 34 cars onto Track No. 132, using the "middle crossovers" in front of the yard office. The Brakeman of the Road Switcher crew rode the east end of the shoving movement onto Track No. 132 as the set out was being made, in order to protect the movement. As the set out was approaching the east end of Track No. 132, the Brakeman noticed the cars at the east end of the track and stopped the movement before coupling onto the standing cars. The Road Switcher crew then coupled onto the cars, at which point the crew members notified the tower that they were not clear of the crossover, and the Train Master instructed them to leave the set out cars standing where they were. At that point, the Conductor tied the hand brake down on Tank Car SRIX 80336 at the west end of Track No. 132. The Road Switcher crew members then returned to their train on Main Track No. 2, where they continued their duty tour and subsequently returned to Fresno, California via shuttle van.

There were a series of crossover switches located in front of the Mormon Yard Office, located between Main Track No. 1 and Main Track No. 2, and Yard Track No. 132/152 and Yard Track No. 133/153. Yard Tracks Nos. 132/152 and Tracks Nos. 133/153 were one continuous track with the separation in name and number being determined by the crossover switch that intersects the tracks. These crossover switches were commonly known as the "middle crossovers." The purpose of the crossover switches was to facilitate train and yard movements from both main tracks to and from Mormon Yard Tracks Nos. 132 and 133. The area around the location of the crossover switches was level and generally free of walking hazards. Track centers between Tracks Nos. 132 and 133 were 13 feet, 2 inches. By regulation, track centers can be no less than 13 feet, which would allow an employee to safely ride the side of a car.

At the time of the incident, the sky was dark and clear, and the temperature was approximately 74° F. Although there were flood lights positioned at specific locations throughout Mormon Yard, the lighting at the location of the incident was dim. There were approximately four flood lights mounted on poles at the accident site; however, none of them was directed toward the exact location of the incident. Exterior lighting at the Mormon Yard Tower and yard office was minimal and provided little illumination beyond the immediate front of the building.

THE ACCIDENT

The Yard Job crew members' final two movements for their shift included a shoving movement of cars to be set out at the end of Yard Track No. 117, returning locomotive lite, and the coupling of two hopper cars that were previously left on the east end of Track No. 133. In both of these movements, the Helper was in control of the move. The Foreman rode the first movement down Yard Track No. 117 and dismounted the point to throw switches at the middle crossover. He then walked over Track No. 132, Main Tracks Nos. 1 and 2, and House Track No. 155 directly in front of the yard office.

The plan was to shove two hopper cars down Track No. 133 through the middle crossover to Track No. 152 where the equipment was to be left at the end of the duty tour. At this point, the Helper was in remote control of the locomotive and was riding the lead hopper car (CMO 10151) during the westbound shove. He was positioned on the north side of the car, which placed him on the track immediately adjacent to the cars that were standing on Track No. 132.

At some point prior to the incident, the Foreman contacted the Helper by radio to inform him that the crossover switches were lined for his movement from Track No. 133 through the crossovers onto Track No. 152.

As the movement proceeded west and began through the crossover switches, a side collision occurred with the Helper's movement on Track No. 133 and standing tank car (SRIX 80336) on Track No. 132 that was fouling the crossover. Eyewitnesses stated the employee was knocked from the car he was riding and fell to the ground. The "tilt" feature of the remote control belt pack activated, and the movement stopped. Witnesses immediately called for emergency medical assistance and stated that when they reached the employee, he was still breathing. However, either prior to, or concurrent with the arrival of emergency responders, the employee succumbed to his injuries and was pronounced dead at the scene.

POST-ACCIDENT INVESTIGATION

The Foreman stated that prior to the incident, he rode a shoving movement westward on Track No. 117 and then walked over to the crossover switches and lined them for movement from Track No. 133 to Track No. 152. After lining the switches, he said he had a radio conversation with the Helper, telling him ". ..you're lined through the crossovers...." At this point, the Foreman stated he went over and "sat down at a table and bench outside the office complex and out of view of the last move" and awaited the Helper, to shove westward down Track No. 133 onto Track No. 152. This would have completed their work for that shift. A review of radio communications suggests the Foreman did not have his lantern with him when he threw the switches from Track No. 133 to Track No. 152 because he was overheard in the radio communication asking the Helper to bring it to him.

A review of the CANAC belt-pack worn by the Helper indicated the movement was proceeding westward at approximately 4.6 mph when the "man down/tilt" feature brought the movement to a stop approximately 24 feet past the point of impact. There was virtually no gap between the north side of the covered hopper car and the south side of the tank car at impact. The west end of the tank car on Track No. 132 was setting 82 feet west of the crossover clearance point, which was marked by a paint stripe on the field side of the south rail. Measurements also indicated the switch stand of the crossover switch leading from Track No.133 to No. 132 was 24 feet west of the clearance point.

A review of radio communication recordings indicated the crew of R-CALOO38-29I and the Train Master knew approximately four to five car lengths of space was available at the east end of Track No. 132 to clear the crossover switch. However, cars were left on the west end of the track in foul of the crossover. Radio communication did indicate that the Conductor of the Road

Switcher asked the Train Master "...Do we have to clear these crossovers completely? Or can we cut them off here?" or words to that effect. The Train Master replied "That's OK." There was no recorded indication that the crew of Y-STO3O1-29A had been informed by the Train Master or the Conductor on the Road Switcher that cars were left foul of the crossover. Photographic evidence revealed that the Foreman would have been in close proximity to the cars on Track No. 132, which were fouling the crossover track, when he threw the east switch to line Track No. 133 for movement through the crossover and onto Track No. 152. Although it was believed he did not have a lantern, his familiarity with the yard, positioning of the cars on Track No. 132, and knowledge of railroad rules should have alerted him to the unsafe condition and to warn the Helper. The Foreman positioned himself directly south of the fouling tank car on Track No. 132 in order to throw the east switch of the crossover. The Foreman stated in his interview that after lining both crossover switches, he inspected them. Radio communication confirmed that he had notified the Helper that the crossover switches were lined for the movement.

At the time of the incident, the Foreman was located approximately 150 feet away, sitting at a picnic table adjacent to and slightly behind the front of the yard office. After hearing the noise of the collision, he realized something had occurred with the move.

The following rules would have applicability to the incident:

- a) General Code of Operating Rule (GCOR) Rule 6.28, Movement on Other than Main Track, states "...Movements must stop within half the range of vision of: Train, Engine, Railroad Car, Men, and Equipment fouling the track, and a Stop Signal, Derail, or Switch lined improperly."
- b) GCOR Rule 7.1, Switching Safely and Efficiently, states "Do not leave cars or engines where they will foul equipment on adjacent tracks or cause injury to employees riding on the side of a car or engine." GCOR 7.1 was violated by the crew on the Road Switcher R-CALOO3S-291, which made the set out onto Track No. 132. The Conductor on the Road Switcher asked permission of the Train Master to leave cars foul of the crossover. The Train Master gave permission for the cars to remain in place in foul of the adjacent track. The Train Master failed to advise the crew on Yard Job Y-STO3O1 -29A of the safety hazard.
- c) GCOR Rule 1.46, Duties of Yard Masters, states "The Yard Master is responsible for and shall directly supervise yard crews, clerks, and all other employees working in the yard. The Yard Master must see that they work in a safe, efficient, and economical manner, according to the rules, regulations, and instructions of the railroad." "At locations where no Yard Master is on duty, these employees will work according to the instruction of the designated employees." At BNSF's Mormon Yard, there were no Yard Masters and the Train Master was the designated employee.

- d) GCOR Rule 7.1, Switching Safely and Efficiently, states "While switching, employees must work safely and efficiently and avoid damage to contents of cars, equipment, structures, and other property. Do not leave cars or engines where they will foul equipment on adjacent tracks or cause injury to employees riding on the side of a car or engine."
- e) BNSF Safety Rule S-1.1, Job Safety Briefing, states "Employees must participate in a job briefing before beginning work or 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...."
- f) BNSF Safety Rule 5-1.2, Rights and Responsibilities, Sub-rule S-1.2.4, Co-workers Warned, states "Warn co-workers of all unsafe practices and/or conditions." Because the Train Master is responsible for safe operation and hazardous conditions, he may be aware of and is an integral part of the participation in job briefings. The investigation disclosed he did not fulfill his required duties when he failed to advise the yard crew of a hazard he was not only aware of, but had actually authorized.
- g) GCOR Rule 8.2, Position of Switches, states "The employee handling the switch or derail is responsible for the switch or derail in use. The employee must not allow movement to foul adjacent track until the hand-operated switch is properly lined. Employees handling switches and derails must make sure switches and derails are properly lined for the intended route."
- h) GCOR Rule 1.1.2, Alert and Attentive, states "Employees must be careful to prevent injuring themselves or others. They must be alert and attentive when performing their duties and plan their work to avoid injury."
- I) GCOR Rule 7.1, Switching Safely and Efficiently, states "While switching, employees must work safely and efficiently and avoid damage to contents of cars, equipment, structures, and other property. Do not leave cars or engines where they will foul equipment on adjacent tracks or cause injury to employees riding on the side of a car or engine."
- j) BNSF Safety Rule S-1.5, Work Environment, Sub-rule, S-1.5.2, Inspection, states
 "... Inspect your work locations for any conditions that might cause injury, property damage, or interference with service. If you find such a condition, take necessary action to protect against the hazard, or discontinue activities in the area."
- k) GCOR Rule 5.2.2, Signals Used by Employees, states "At Night....Use the correct color of flags or lights." In this case, that would have been a lantern for safety use in the dark.
- 1) BNSF Safety Rule S-I 3.1.5, Riding on moving Equipment, states "Ride cars or equipment only if necessary and if you have determined that you can do so safely." The Foreman of

Yard Job Y-STO3O1-29A was the employee who handled the switches in this case. The Helper did not handle any switches, nor was he required to, once he was advised the switches were properly lined for the route to be taken. The Foreman lined both ends of the crossover switches leading from Track No. 133 and onto Track No. 152 as was required of him, according to the movement that was agreed upon and understood by himself and the Helper. The Foreman, who was positioned directly in front of and directly adjacently to the cars fouling the crossover track, did not acknowledge the hazard even though he walked by the fouling cars and stooped to throw the switch between Yard Tracks Nos. 132 and 133, after which he advised his Helper the route was properly lined for movement through the crossover. The evidence suggests the Foreman did not have his lantern with him at the time he threw the switches. The Foreman violated railroad rules when he threw the switches but failed to remain alert and attentive, which should have enabled him to note the cars fouling the track for his movement.

Results of the toxicological testing of the decedent and the Foreman were negative.

The San Joaquin County Medical Examiner's Report of Investigation, dated Sept. 24, 2007, revealed the cause of death as blunt force injuries of the head and chest.

Following the incident, BNSF published an article in its Sept. 13, 2007, "Focus on Safety" newsletter which described the fatality and cautioned employees to operate at speeds that were appropriate to conditions and allowed stopping in half the range of vision. No rule or procedural changes were implemented at Mormon Yard. However, flat, highly-reflective markers were placed on the field side ends of the wooden crossities at each clearance point. Yard and train crew employees had indicated they were effective in illuminating the clearance points.

BNSF Los Angeles and California Divisions, General Notice No. 123, dated Aug. 30, 2005, identified "dangerous decisions" which had resulted in serious or fatal injuries. This notice identified that "handling cars ahead of engines" could be a deadly decision, and the notice provided rule identification for guidance.

BNSF held no formal investigation on any employee to develop the facts of the case.

Analysis and Conclusions

The Conductor of Road Switcher R-CALOO38-29I should not have left cars which could foul equipment on adjacent tracks or cause injury to employees riding on the side of a car. Also, the Conductor should not have asked the Train Master if it was acceptable to leave cars in a fouling position.

Once advised of the cars left foul at the crossover, the Train Master should have given instructions to move cars clear of the crossover or he should have warned the Yard Job Crew of the hazard that was now at hand.

It was not determined whether the Foreman saw the standing cars on Track No. 132; however, the investigation disclosed he was aware cars had previously been set out on that track. When the Foreman failed to keep his lantern with him, he not only jeopardized his personal safety as he crossed tracks and threw switches, but supported his claim that he was unaware of any hazardous condition at the crossover. The Foreman's absence from the track area for an indeterminate period of time placed him in a position where he was unable to warn his Helper during his approach that the cars on Track No. 132 were fouling the crossover switches.

The investigation disclosed railroad employees who were on-duty throughout the night were aware of non-complying and hazardous conditions; however, there was no evidence to support that subsequent job safety briefings were held.

The Helper had certain responsibilities for his own safety during the move and had choices he could have made to secure his safety. For instance, he could have walked the distance of the track estimated to be about 3,000 feet to see if the crossover was clear. He could have stopped the movement prior to entering the crossover, to insure the cut of cars he was riding adjacently to it were clear for his movement through the crossover. He could have ridden on the south side of the cut he was shoving, which would have given him much more sight distance ahead and to either side because there were no cars on the adjacent track to the south side of his movement. Nevertheless, the failures of his Train Master and his Foreman to advise him of the hazard at the crossover and to protect him during the final stages of the shove precipitated the events leading to the Yard Helper's death.

SUMMARY FOR FE-20-07 SELECTED AND POSSIBLE CONTRIBUTING FACTORS

Railroad: Union Pacific Company (UP) Location: Martinez, California Region: 7

> Month: October Date: Oct. 23, 2007 Time: 12:37 p.m., PST

Data for Fatally Injured Employee(s)

Bridge Inspector 59 years old 29 years of service

Last rules training: Maintenance of Way (MOW) rules update, Jan. 3, 2007

Last safety training: On-Track Safety, Jan. 4, 2007; Bridge Worker Safety, Feb. 20, 2007; Safety Certification, Feb. 20, 2007; and Lead Safety Training, March 14, 2007

Last relevant efficiency test: Manager's one-on-one, June 26, 2007

Data for All Employees (Craft, Positions, Activity)

Craft: MOW

Positions:

Bridge Inspector (Lone Worker)

UP Work Train WOZOZB-23

Locomotive Engineer Conductor Brakeman

Yard Master Benicia Local Switching Crew (remote control locomotive) Construction Crew Draw Bridge (Control) Operator UP Dispatcher

SUMMARY FOR FE-20-07 CONTINUED

SELECTED FACTORS CONTINUED

Positions Continued:

Manager of Inspections Manager of Structures

Activity (of fatally injured employee)

Bridge Inspection

EVENT

A Bridge Inspector was fatally injured when struck by a train during bridge inspection activities.

POSSIBLE CONTRIBUTING FACTORS

<u>PCF No. 1</u>

The Manager of Inspections, Manager of Structures, and Control Operator had not been informed that the Bridge Inspector would be on the bridge on the day of the fatal incident. The Bridge Inspector, therefore, received no safety briefings.

PCF No. 2

A re-enactment revealed that visibility was poor at the accident site due to the right-hand curve, glare from the sun, and shadows from the surrounding structures.

<u>PCF No. 3</u>

Because the locomotive was traveling long hood forward, the train horn was facing the opposite direction of travel. Therefore, it was ineffective in warning of the train's approach. Compounding the problem, vehicular traffic noise from the overhead freeway bridges and construction noise interfered with the Bridge Inspector's ability to hear the train horn.

PCF No. 4

The Bridge Inspector, in violation of Federal regulations and railroad operating rules, used Individual Train Detection without criteria being met for that method of On-Track Safety (OTS). Specifically, the employee was working within the limits of a manual interlocking or control
SUMMARY FOR FE-20-07 CONTINUED

POSSIBLE CONTRIBUTING FACTORS CONTINUED

PCF No. 4 Continued

point; was not able to visually detect the approach of a train and clear the track 15 seconds prior to its arrival; was working where power-operated tools and machines were being used; and was prevented from hearing the approach of a train by background noise from vehicular traffic and machinery.

PCF No. 5

In its timetable, UP did not designate the Suisan Bay Bridge as a manual interlocking or control point, where Individual Train Detection was not allowed. This could have created confusion for the Bridge Inspector, who otherwise most likely would have chosen a more restrictive, safer type of OTS.

PCF No. 6

The Bridge Inspector did not have immediate access to a radio to monitor train transmissions.

REPORT:	FE-20-2007		
RAILROAD:	Union Pacific Company (UP)		
LOCATION:	Martinez, California		
DATE &TIME:	Oct. 23, 2007; 12:37 p.m., PST		
EVENT ¹ :	A Bridge Inspector was fatally injured when struck by a train during bridge inspection activities.		
EMPLOYEE:	Craft:	Maintenance of Way (MOW)	
	Occupation:	Bridge Inspector	
	Age:	59 years	
	Length of Service:	29 years	
	Last Rules Training:	MOW Rules Update - Jan. 3, 2007	
	Last Safety Training:	On-Track Safety Training - Jan. 4, 2007 Bridge Worker Safety - Feb. 20, 2007 Safety Certification - Feb. 20, 2007 Lead Safety Training - March 14, 2007	
	Last Relevant Efficiency Test:	Manager's one on one - June 26, 2007	

CIRCUMSTANCES PRIOR TO ACCIDENT

At 12:37 p.m., on Oct. 23, 2007, westbound UP Work Train WOZOZB-23, traveling at 27 mph with a locomotive and five empty ballast cars, struck and fatally injured a UP Bridge Inspector on Main Track No. 2 on the Suisun Bay Bridge, milepost 33.1, near Martinez, California. The Bridge Inspector was walking eastbound between the gage of the rails of Main Track No. 2 and was observed pushing a measuring wheel in the performance of his duties.

1

[&]quot;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 Bridge Inspector reported for duty at the UP Elmira Yard, near Vacaville, California, at 7:30 a.m., PST. UP's Manager of Structures, located in Stockton, California, called the Bridge Inspector on his cell phone to see if he would be in the area near Martinez, California and, if so, if he would be available to investigate some Vehicle Track Interactions (VTI) identified on the Suisun Bay Bridge, UP Mileposts 33.74 and 33.86, on UP's No. 2 Main Track. According to the Manager of Structures, the Inspector could not say whether or not he would be in that area that day, but if he were, he would look at the spots on the bridge.

Certain UP locomotives and railroad cars are equipped with sensors that detect deviations in ride quality as they travel over a section of track. These deviations are identified as the locomotive or rail car interacts with the track structure. This interaction is known as a VTI. A significant deviation in ride quality will trigger notification of the supervising manager for the area, who then must arrange for inspection and address the VTI condition. Poor ride quality or VTI is not a defect as addressed in the Code of Federal Regulations (CFR) Title 49, Part 213, Track Safety Standards.

A UP work train crew consisting of a Conductor, Engineer, and Brakeman reported for duty at 8 a.m. at the Ozol Yard office located in Martinez, California, at UP Milepost 31. The crew members had completed the required statutory off-duty period and performed a job briefing with the Yard Master. The Yard Master instructed them to use UP Locomotive 2561, pick up five loaded ballast cars and travel to Benicia Yard at milepost 36, and work with UP maintenance construction crews who would unload the ballast cars. The designation of the UP work train was WOZOZB-23.

UP's Roseville Area Timetable No. 4 identified the tracks between the Ozol and Benicia Yards, UP mileposts 31.0 to 34.5, as controlled by Centralized Traffic Control (CTC), with Main Tracks Nos. 2 and 3 within this jurisdiction. The control points on either side of the incident location were Vista, RV033, UP milepost 33, and Benicia, RV035, UP milepost 34.5. There was a draw bridge between these two points, and trains were required to contact the Control Operator on the bridge, who then aligned the signals for the train operation. The timetable designated the tracks as east/west main tracks. The speed was listed as 30 mph for freight trains and 40 mph for passenger trains.

The train crew members made up their train in the Ozol Yard, and at approximately 9:30 a.m. were prepared to depart en route to Benicia Yard, some four miles away. Train operation was governed by signal indication by authority of the UP Dispatcher as well as notification to the Draw Bridge Operator. The work train employees left Ozol, eastward (timetable) with five trailing ballast cars, and arrived at the Benicia Yard between 10 and 10:15 a.m. Their work at Benicia was coordinated with job briefings with the Benicia local switching job crew (a Remote Control Locomotive (RCL) operation crew) and the construction crew who would unload the ballast cars. The planned work required them to place the loaded cars on the opposite end of the locomotive, shove east into the work site, and unload the ballast westward. The RCL crew helped spot the cars on the opposite end of the locomotive, and MOW crews unloaded the rock as planned, completing the work train's work in the Benicia Yard.

As the Benicia Yard was full of railroad cars, the work train crew called the Ozol Yard Master to see where he wanted the train put away. He instructed them to bring the work train back into the Ozol Yard to leave room for the RCL, still in Benicia. Since the Benicia job crew had already helped the work train crew place the five ballast cars on the opposite end of the locomotive, the WOZOZB-23 was set up to travel west, back to Ozol, long hood forward.

The weather conditions were mild, sunny, and moderately breezy; the temperature was approximately 75° F.

THE ACCIDENT

According to the train crew members, they were given permission to enter the No. 2 Main Track shortly after 12 p.m. The Conductor lined the derail and main line switch, and the UP 2561 with five empty cars occupied the main track. He then lined the derail and switchback to normal positions and boarded the locomotive. At 12:30 p.m., the crew of the WOZOZB-23, seated in the locomotive, contacted the Control Operator of the draw bridge and received permission and a signal to head west over the bridge on the No. 2 Main Track. The train was reported to be operating at 27 mph, down an approximate 1 percent grade, on a tangent portion of the bridge before it entered a 4-degree, right-hand curve off of the west end of the bridge.

The Conductor and Brakeman were looking for the next signal aspect at the Vista Interlocking when they saw a person wearing a hard hat walking between the rails eastbound with his head down and holding or pushing a measuring wheel. The Conductor yelled to the Engineer "Man on the tracks." The Engineer immediately applied an emergency air brake application 156 feet before the point of contact and activated the horn. The train struck the Bridge Inspector and then stopped approximately 400 feet after contact.

While the Engineer immediately radioed in an emergency call for assistance, the Conductor and Brakeman ran to the location of the fallen employee. He was found approximately 10 feet to the south side of Main Track No. 2. The Brakeman was the first person to see the victim lying next to the track and stated the victim looked as though he were dead. No emergency first aid was performed. Martinez police officers were dispatched at 12:43 p.m. and arrived on the scene shortly thereafter, as did emergency medical personnel. The Contra Costa County Coroner's office was notified of the incident at 1:39 p.m. and arrived on scene at 2 p.m. An autopsy concluded the cause of death as blunt force head injury. It was believed that the victim was using the measuring wheel to locate the VTIs on the Suisun Bay Bridge he had been given earlier that morning.

Interviews with UP MOW managers revealed that following the incident, all train traffic was stopped until it was determined it would be safe to continue operations. Only Main Track No. 1 was reopened until the police, emergency medical personnel, and Coroner had completed their investigations. Environmental clean up was completed at 4:22 p.m. The work train was not moved from where it had stopped following the incident. The crew remained until UP managers had interviewed the Brakeman, Conductor, and Engineer. The No. 2 Main Track was reopened at approximately 7 p.m. for normal operation.

POST-ACCIDENT INVESTIGATION

The incident occurred off the west end of the Suisun Bay draw bridge. This steel structure had two main tracks fastened to an open, wooden deck, with wooden, steel, or cable hand rails, and grated steel walkways. The bridge was approximately one mile long and 85 feet above sea level on either end with a draw bridge near the center, which rose to approximately 135 feet, allowing vessels to pass underneath. As it approached the bridge, the westbound work train encountered a varying uphill grade (plus or minus .4 percent) and a left-hand curve (plus or minus 3° , 30°) before entering the tangent bridge section, which rose gradually to the center before descending. After passing through the lift portion of the draw bridge, the train started down a slight grade on tangent track before entering a right-hand curve. The grade off the west end of the bridge was plus or minus -1 percent, and the curve was plus or minus 4° . This curve off the end of the bridge was where the incident occurred.

Above and on either side of the trestle on Interstate 680 (I-680) were two separate concrete bridge structures for vehicular traffic. Walking east on the tracks (timetable), southbound I-680 was above and directly to the left. Above and to the right were the northbound lanes with the railroad operation between and relatively parallel to the adjacent I-680 bridges. Vehicular traffic on these bridges created additional noise.

Federal Railroad Administration (FRA) and California Public Utilities Commission (CPUC) investigators arrived in Martinez, California at 6 a.m. the following day. At approximately 7:30 a.m., UP management conducted a briefing at the MOW office and provided the pertinent information regarding the fatality, including the employee's name, age, years of service, training records, and UP's account of the incident.

FRA and CPUC were able to determine by interviewing UP managers that the deceased employee was found with his on-track safety job briefing booklet, which he had completed. His form of protection was stated as Individual Train Detection (ITD); his Lone Worker form stated the maximum speed was 40 mph, requiring a sight distance of 880 feet. The employee was wearing his personal protective equipment, i.e. vest, hard hat, and safety shoes. No radio was found on or near his body; however, a handset radio was found in his company truck some distance away. The walking wheel he was using was also found on the tracks in close proximity to his body.

Following the briefing and office interviews, FRA and CPUC Inspectors arrived at the scene of the incident at 10:30 a.m., where they met and interviewed the deceased employee's supervisor, Manager of Inspections. He stated he had not spoken with his Inspector since the week before and did not know the Inspector would be around the bridge that day. UP's Manager of Structures had spoken to the Inspector that morning; however, he had no idea of the Inspector's plans following their telephone conversation or where he would be during the day. An interview with the Control Operator of the draw bridge revealed that he did not know the Inspector was in the area or on the bridge that day.

The locomotive and the five empty ballast cars of WOZOZB-23 had been kept intact at the Ozol Yard following the fatality and were returned to the scene for a re-enactment, which would occur at the same time and location as the previous day. The re-enactment identified that the views from the locomotive were marginal at best due to the right-hand curve, glare from the sun, and shadows from the surrounding structures. Because the locomotive was traveling long hood forward, the train horn was facing opposite the direction of travel and was ineffective in warning of the train's approach. Vehicular traffic noise from the overhead freeway bridges and other ambient construction noises may have contributed to the decedent's inability to hear and react to the approaching train.

The post-accident investigation included a review of the victim's rules training, qualifications, and work history. Training and qualifications were current, and his regular assigned off days were Saturday and Sunday. Also reviewed were the UP's rules and procedures governing Workplace Safety, specifically Roadway Worker Protection and OTS.

The event recorder download of UP Locomotive 2561 revealed the train was operating at 27.3 mph when the emergency application was initiated, well within the 30 mph speed limit posted in the timetable for this location.

Analysis and Conclusions

FRA toxicological tests on the decedent were negative.

The Contra Costa County Coroner conducted an autopsy on Oct. 24, 2007; the decedent's remains were released to a mortuary on Oct. 25, 2007. The autopsy findings listed the cause of death as blunt force head injury.

The Code of Federal Regulations (CFR), Title 49, Part 214, Subpart C, Roadway Worker Protection, prescribes minimum safety standards for roadway workers. Each railroad to which this part applies must adopt and implement a program that will afford on-track safety to all roadway workers whose duties are performed on that railroad. Each program must provide for the levels of protection specified in 49 CFR, Part 214; UP had such a program called OTS.

Each type of OTS has criteria which determine the appropriate protection to be used. First, a determination is made whether or not the track is "controlled" or "non-controlled." This determination dictates the type of protection which may be used. Working limits on controlled track must conform to the provisions of one of the following methods used when occupying the track: exclusive track occupancy; foul time; train coordination; or train approach warning provided by a watchman/lookout.

The Bridge Inspector was a roadway worker; therefore, OTS was required when an employee fouled or had the potential to foul a track. Roadway workers were required to be initially and annually trained in the types of OTS they would use while on or near the track. Each type of OTS training, whether roadway worker, lone worker, watchman/lookout, flagman, or operator of maintenance machines, required demonstrated proficiency. Initial and periodic training and

qualification for employees who provided OTS to work groups were required to be evidenced by a recorded examination. The decedent had all of the required training and qualifications required by the CFR. In this case, the victim was a lone worker fouling a controlled track.

A lone worker who fouls a track while performing routine inspection or minor correction may use individual train detection (ITD) to establish on-track safety only if he is: (1) trained and qualified; (2) performing routine inspections and minor repairs; (3) outside the limits of a manual interlocking, control point, or remotely controlled hump yard facility; (4) able to visually detect the approach of a train and clear 15 seconds prior to its arrival; (5) working where no power-operated tools or roadway maintenance machines are in use; and (6) able to hear and see the approach of train or other on-track equipment, unimpeded by background noise, lights, precipitation, fog, passing trains, or any other physical condition, in accordance with 49 CFR § 214.337c.

Federal regulations also require that each lone worker be provided and, where practicable, maintain immediate access to a working radio. When immediate access to a working radio is not available, the lone worker must be equipped with a radio capable of monitoring transmissions from train movements in the vicinity. Following the fatality, a site inspection revealed no radio was found on or near the victim, but a handset radio was found in his company vehicle some distance away.

Each lone worker was required to communicate at the beginning of each duty period with a supervisor or another designated employee to receive a job briefing and to advise of his planned itinerary and the procedures that he intended to use for on-track safety. When communication channels were disabled, the job briefing had to be conducted as soon as possible after the beginning of the work period when communications were restored. The decedent's supervisor (Manager of Inspections), located in Texas, had not spoken with him the day of the incident. The local manager (Manager of Structures) had spoken with him that morning; however, they did not discuss his planned itinerary or the procedures he would use for on-track safety.

Freight train crews approaching the draw bridge must read and follow the System Special Instructions contained in the Roseville Timetable. SI-08 Rules Items, Rule 6.16, Martinez states that freight train crews approaching draw bridge MP33.3 over Suisun Bay must contact the Control Operator before passing Vista (eastward trains) or Benicia (westward trains).

The UP Timetable designated the track where the fatality occurred, between UP mileposts 33 (Vista) and 34.5 (Benicia) as CTC. The draw bridge located between Vista and Benicia was not designated as either a draw bridge, manual interlocking, or a control point in the timetable. Using the timetable information, a roadway worker might determine that Individual Train Detection was an allowable form of OTS. However, the points between Vista and Benicia were controlled by an operator with the ability to control train movements, operate signals, and issue main track authority to MOW employees, making this portion of track by definition, a manual interlocking, where roadway workers could not use Individual Train Detection.

The decedent was trained and qualified by UP to occupy tracks on controlled and non-controlled tracks. In its timetable, UP does not designate the Suisun Bay Bridge as a manual interlocking or control point; therefore, employees using the timetable to determine the appropriate type of on-track safety at this location could incorrectly choose Individual Train Detection, just as the decedent did.

While the employee used a type of OTS consistent with occupying controlled track, the Lone Worker failed to maintain a vigilant watch for the approach of the oncoming train. He did not choose a more restrictive type of OTS allowed by the safety regulations or the UP. He neither completed a job briefing that defined when and where he would be that day, and the type of protection he would incorporate, nor did he have direct and immediate access to a radio to monitor train transmissions. Furthermore, Individual Train Detection may not be used to establish on-track safety on track inside the limits of a manual interlocking. UP training and FRA on-track safety regulations prescribe the type of roadway worker protection required when occupying an interlocking. The decedent was trained in these requirements.

UP did not agree with FRA's determination that the Suisun Bridge met the definition of a manual interlocking. However, following the fatality, UP issued a safety alert stipulating the proper type of on-track safety to be used while occupying the structure, but it did not change its timetable or designate the structure as a control point or manual interlocking.

The probable cause of the incident was the decedent's failure to observe on-track safety rules and procedures and to maintain a vigilant watch for the oncoming trains.

SUMMARY FOR FE-21-07 SELECTED AND POSSIBLE CONTRIBUTING FACTORS

Railroad: CSX Transportation, Incorporated (CSX) Location: Russell, Kentucky Region: 3

> Month: October Date: Oct. 27, 2007 Time: 1 a.m., EST

Data for Fatally Injured Employee(s)

Yard Foreman 52 years old Less than one year of service Last rules training: Aug. 13, 2007 Last safety training: Aug. 13, 2007 Last physical: April 19, 2007 Last relevant operational test: Oct. 21, 2007

Data for Al Employees (Craft, Positions, Activity)

Craft: Transportation and Engine

Positions:

Yard Assignment Y326-26 Locomotive Engineer Yard Foreman Conductor Trainee

Through-freight crew of Train G879-25 West End Light Side Job crew Dispatcher Big Four Yard Master Coal Hump Yard Master

<u>Activity</u>

Switching

SUMMARY FOR FE-21-07 CONTINUED

SELECTED FACTORS CONTINUED

EVENT

A Yard Foreman was fatally injured when crushed between the locomotive he was riding and standing rail equipment on an adjacent track, during a switching operation.

POSSIBLE CONTRIBUTING FACTORS

<u>PCF No. 1</u>

The Yard Foreman failed to properly align the switches for his intended route.

PCF No. 2

The Yard Foreman was inexperienced, having only working as a qualified Conductor for two months and on yard assignments for a little over one month.

PCF No. 3

Without adequate experience and training, the Yard Foreman was given responsibility for the Conductor Trainee, in addition to his own duties. The added responsibility was a potential distraction for an inexperienced employee.

REPORT:	FE-21-2007		
RAILROAD:	CSX Transportation, Incorporated (CSX)		
LOCATION:	Russell, Kentucky		
DATE & TIME:	Oct. 27, 2007; 1 a.m., EST		
EVENT ¹ :	A Yard Foreman was fatally injured when crushed between the locomotive he was riding and standing rail equipment on an adjacent track, during a switching operation.		
EMPLOYEE:	Craft:	Transportation and Engine	
	Occupation:	Yard Foreman	
	Age:	52 years	
	Length Of Service:	Less than one year	
	Last Rules Training:	Aug. 13, 2007	
	Last Safety Training:	Aug. 13, 2007	
	Last Physical:	April 19, 2007	
	Last Relevant Operational Test:	Oct. 21, 2007	

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On Oct. 26, 2007, a CSX yard crew consisting of an Engineer, a Yard Foreman, and a Conductor Trainee reported for duty at 11 p.m. at the CSX Russell Terminal's Big Four Yard Office, in Russell, Kentucky. The crew was assigned to conventional Yard Assignment Y326-26, which was referred to as the "Super Job." The Yard Foreman was working from the extra board, and the Conductor Trainee was preparing a training schedule. All crew members had worked this assignment the previous night.

The primary objective of the Y326-26 yard assignment crew was to take locomotives from the Russell Yard servicing/fueling facility and couple them to outbound trains in preparation for departure out of the terminal. These movements facilitated the timely departure of trains by relieving outbound train crews from having to perform this initial terminal duty.

The Y326-26 yard crew members reviewed the Dispatcher's bulletin along with other requirements during their initial job briefing and then contacted the Big Four Yard Master to

1

[&]quot;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.

receive a job briefing and obtain their duties and instructions regarding the movements they would make at the beginning of their tour of duty. The Yard Master advised them that their first move was to take a 4-locomotive consist from the locomotive servicing/fueling tracks to the west end of Track R-04 and couple to the one locomotive already on the track. After coupling to the locomotive, they were to couple all five locomotives to outbound Train Q319-27, which was also located on Track R-04.

The yard crew departed the yard office and was transported to the locomotive servicing/fueling facility by the contract van/taxi. Upon arrival, the crew members took charge of Locomotives GCFX 3082, CSXT 8516, CSXT 4305, and CSXT 4718. When they were ready to depart the facility, they contacted the Coal Hump Yard Master for instructions regarding the route they were to take to the west end of the yard to Track R-04.

The Coal Hump Yard Master instructed the yard crew on the route to utilize the servicing/fueling facility and then proceed to the Heavy Side Lead. This was the extent of his control. They would have to talk to the Big Four Yard Master for further instructions. The crew members proceeded in accordance with the instructions from the Coal Hump Yard Master, arriving at the east crossover between the Heavy Side Lead and the M-01 Lead where they contacted the Big Four Yard Master for further instructions. The Big Four Yard Master informed them that they would have to wait for another yard assignment, the West End Light Side Job, to depart the west end of the light side yard on the M-01 Lead before they could move onto the M-01 Lead.

The Y326-26 yard crew members stopped short of the east crossover from the Heavy Side Lead/Johnson Lead to the M-01 Lead and waited for the West End Light Side Job crew to proceed west, before making their move onto the MM 1 Lead. The yard crew observed that the outbound through-freight crew of Train G879-25 was on Track T-03, which intersected the Heavy Side Lead near where they were stopped. The G879-25 train crew members advised the yard crew that they had placed a defective locomotive from their train onto Track R-05 for movement back to the locomotive shop and they were also going to set out a defective rail car, 66 cars deep in their train, onto the same track as the defective locomotive. During this exchange between the two crews, the Light Side movement cleared the westbound section of the M-O1 Lead, and the crew of Y326-26 made its movement onto the M-01 Lead through the east crossover. The Engineer of Train G879-25 asked the Engineer of the Y326-26 if he would ask his ground crew to make sure that the crossover switch was aligned for his westbound movement on the Johnson Lead so he could set out the defective rail car. The Y326-26 Engineer indicated that he would get his crew to align the switch for his movement.

The Y326-26 crew proceeded through the east crossover from the Heavy Side Lead/Johnson Lead to the M-O1 Lead and restored the switches for straight lead movement. The Engineer was operating the locomotive consist from the north side of the west locomotive, GCFX 3082. When he observed that the one locomotive already on Track R-04 was a wide body locomotive, CSXT 5242, he advised the Yard Master and suggested that the locomotive be used as the lead locomotive of Train Q319-27 because it was a better locomotive than the GCFX 3082. The Yard Master agreed. The yard crew members placed the 4-locomotive consist on the switching lead toward Track R-01, clear of Track R-04. They secured the locomotives, dismounted the

locomotive consist, and took control of the single locomotive on Track R-04. After making an initial inspection, they moved Locomotive CSXT 5242 west from Track R-04 onto the M-01 Lead clear of the switch, then moved eastward and coupled to the 4-locomotive consist. At this time, the crew secured all hose and control couplings between the locomotives, making the CSXT 5242 the lead and controlling locomotive on the west end of the 5-locomotive consist.

While the Y326-26 crew members were securing the coupling between Locomotive CSXT 5242 and the 4-locomotive consist on the R-01 switching lead, the West End Light Side Job crew returned eastbound on the M-01 Lead. They operated eastbound to the West End Light Side Switch, aligned the switch for movement onto the West End Light Side Lead, then proceeded eastbound on the lead to the light side yard. This movement resulted in the switch at the intersection of the M-01 Lead and West End Light Side Lead, located about 50 feet west of the east crossover, being aligned against the movement of the Y326-26 from the R-01 Switching Lead onto the M-01 Lead. As the Engineer of Y326-26 finalized his inspection of the 5-locomotive consist, the Yard Foreman and the Conductor Trainee walked westward on the south side of the M-01 Lead toward the West End Light Side Switch. They operated the switch, aligning it to accommodate their movement back to Track R-04 with the five locomotives.

The crew members of Train G879-25 had taken charge of their train on Track T-03 and had been instructed to set out one locomotive and a defective rail car on their train to Track R-05. The train crew was in the process of pulling westbound on the Johnson Lead, adjacent to the M-01 Lead, far enough to accommodate setting out the defective rail car, 66 cars deep in their train. Train G879-25 moved westbound about 66 car lengths, at which point the Conductor separated the head 66 rail cars from the rest of the train. He then instructed the Engineer to pull westbound again far enough to clear the R-05 switch. The Conductor instructed the Engineer to stop the train as he operated the switch to Track R-05, where he intended to place the defective rail car.

As the G879-25 Train Crew was making its move on the Johnson Lead, the crew members of Y326-26 prepared to make their move onto the M-01 Lead. The Engineer of Y326-26 indicated he was ready to move, and the Yard Foreman, via radio communication, indicated that he and the Conductor Trainee were ready for him to proceed west and that the switches were aligned for his movement. The Engineer proceeded westbound with the five locomotives, operating from the north side of the west locomotive. He operated the locomotives in accordance with the radio instructions of the Yard Foreman, stopping when instructed west of the east crossover switch.

The Johnson Lead and the M-01 Lead extended for some distance parallel and adjacently to one another in an east-west direction, with the Johnson Lead north of the M-01 Lead. From the west, approaching the accident site on the M-O1 Lead, there were in succession the south switch of the west crossover, the West End Light Side Switch, the south switch of the east crossover, and the R-04 Switch to Track R-04 which was straight ahead, and the switching lead for tracks R-03 through R-01. On the Johnson Lead, the first switch eastbound after the east crossover was the R-05 Switch to Track R-05, which was straight ahead. This track, as it proceeded down a switching lead, was designated the Heavy Side Lead and provided access to tracks T-01 through T-05.

The area at the site and in the vicinity of the incident was a level yard switching environment. There was a yard lighting tower 254 feet from the scene of the incident. At the time of the incident, the sky was clear, and the temperature was 59° F. There had been rain in the recent past, and some mud was present, but muddy conditions were not prevalent.

THE ACCIDENT

Train G879-25 was stopped on the Johnson Lead while the Conductor aligned the R-05 Switch in preparation to shove eastward to leave the defective rail car on Track LOS. The Y326-26 crew was stopped on the M-01 Lead, 57 feet west of the east crossover south switch. The Conductor Trainee asked the Yard Foreman if he should operate the switch. The Yard Foreman indicated he would operate the switch and the Conductor Trainee should go ahead and get up on the leading end of the first (east) locomotive. The Conductor Trainee walked to the east end of the east locomotive and mounted the bottom step on the south side of the locomotive. The Yard Foreman operated the south switch of the east crossover, then walked to the east end of the east locomotive and mounted the north side steps. He asked the Conductor Trainee if he was ready to move, and the Conductor Trainee replied that he was. The Yard Foreman then initiated a radio communication to the Engineer of Y326-26, informing him that he and the Conductor Trainee were aboard the lead end of the movement, and instructed the Engineer to shove east to a safety stop in about eight car lengths.

The Engineer initiated an eastbound movement of the five locomotives, expecting to stop in about eight car lengths prior to coupling with the rail cars on Track R-04. The movement proceeded eastbound, attaining a speed of 6 mph, about nine feet per second. After moving 57 feet east, Y326-26 started through the crossover from the M-01 Lead, heading to an impact with Train G879-25, standing on the Johnson Lead. At some point during this movement, the Conductor Trainee and the Yard Foreman realized the mistake and started yelling, "Stop, Stop, Stop," via radio. The Engineer initiated a full service independent brake application, but the movement impacted the 59th and 60th head rail cars of the standing train and subsequently shoved them 42 feet prior to stopping. The total eastward movement of the Y326-26 locomotive consist was 185 feet.

The Yard Foreman, apparently caught off guard by the unexpected direction of the movement, had little or no time to effect any evasive action. He was pinned in the position he occupied on the north side steps of the lead end of the east locomotive. The collision resulted in the Yard Foreman being crushed between the locomotive and rail equipment on the adjacent track, causing fatal injuries by virtue of massive blunt force trauma.

There were at least three calls initiated to the 911 emergency response center, requesting medical assistance and ambulance service within two minutes after the incident. The Greenup County EMS arrived at 1:25 a.m., evaluated the scene, and confirmed the fatality. The Engineer of Train G879-25 indicated that he had initiated an emergency call on his cell phone at the time of the incident and took note of the time on his cell phone as 1:02 a.m.

The Russell Fire Department responded, but its services were not utilized. R.J. Corman Corporation Construction Company arrived at 3:15 a.m. to aid in the separation of the equipment to extract the body, and then to aid in the removal and repair of the derailed equipment. Total equipment and track structure damages were estimated to be \$1,900.

POST-ACCIDENT INVESTIGATION

Federal Railroad Administration (FRA) Motive Power and Equipment inspections were conducted subsequent to the incident. Mechanical inspections were performed and included locomotive brake function and efficiency, radio function, and safety appliance condition. No defective conditions or equipment malfunctions were found. Inspections conducted by FRA inspectors revealed no defective conditions which may have caused or contributed to the severity of the incident.

There were no other pertinent inspections or investigations conducted by other Federal or state government agencies, or other public entities.

WA Post-Accident and Fatality alcohol and drug test samples were collected from the fatally injured employee and other members of his crew along with the crew members of Train G879-25. Test samples from all employees produced negative results for the drugs tested.

Analysis and Conclusion

Investigators found no evidence of impairment by alcohol or drugs in tests of all of the employees of Yard Assignments Y326-26 and Train G879-25. Equipment inspections revealed no evidence of equipment malfunction or failure. Weather and environmental factors did not appear to have any bearing on the cause or severity of the incident. The other Y326-26 crew members indicated that the officers and management of the railroad were not engaging in any attempt to force them to work faster to increase production. The rest of the crew did not voice any concerns relating to fatigue issues, as this was a yard assignment. The other crew members working with the Yard Foreman were not aware of any distractions or overriding concerns which would have diverted the Yard Foreman from attention to his duties.

During the course of the investigation, the two factors identified which may have possibly contributed to the incident were the inexperience and inadequate training of the Yard Foreman, along with his added responsibility for the Conductor Trainee. The Yard Foreman had only been working as a qualified Conductor since being promoted on Aug. 13, 2007. He had only worked through-freight assignments until Sept. 14, 2007, when he also made himself available for yard assignments. Since then, he had worked both.

Newly promoted employees were required to wear a yellow hat during work, to designate that they were inexperienced employees with less than one year of service. As such, the Yard Foreman was considered to be an employee of special concern for other more experienced employees, as were all employees with less than one year of experience. In addition, with only about two months of independent experience, the Yard Foreman was placed in a position of not only having to perform his duties, but training and protecting the Conductor Trainee. The probable cause of the incident was the failure of the Yard Foreman to properly align the switches for his intended route.

APPLICABLE RULES

CSX Transportation, Inc. Operating Rules Effective Oct. 1, 2004

Operating Rule 104 - HANDLING SWITCHES: The employee handling switches, derails, track skates, or gates is responsible for the position of these devices. This does not relieve other crew members of such responsibility, if they can see the position of the devices.

Operating Rule 104 C - HANDLING SWITCHES: Employees lining switches must ascertain that:

- 1. The route is lined for the movement,
- 2. The switch points fit properly, and
- 3. The lever is secured.

SUMMARY FOR FE-25-2007 SELECTED AND POSSIBLE CONTRIBUTING FACTORS

Railroad: Burlington Northern Santa Fe Corporation (BNSF) Location: Bristol, Illinois Region: 4

> Month: December Date: Dec. 28, 2007 Time: 10:20 a.m., CST

Data for Fatally Injured Employee(s)

Brakeman 62 years old 36 years of service Last rules training: April 22, 2006 Last safety training: April 22, 2006 Last physical: Unavailable Last relevant efficiency test: Dec. 11, 2007

Data for All Employees (Craft, Positions, Activity)

Craft: Transportation and Engine

Positions:

BSNF Train Crew (Assignment CH145 11)

Locomotive Engineer Conductor Brakeman

Dispatcher

Activity

Switching

EVENT

A Brakeman was fatally injured when caught between rail equipment during a switching operation.

SUMMARY FOR FE-25-2007 CONTINUED

POSSIBLE CONTRIBUTING FACTORS

<u>PCF No. 1</u>

When Car AOK 28214 was cut off in motion and allowed to roll freely toward secured equipment on Track No. 1, it failed to couple. Neither the Brakeman nor Conductor was at a location to see that the car had not coupled.

PCF No. 2

Crew members failed to verify whether or not Car AOK 28214 had coupled to equipment on Track No. 1.

PCF No. 3

Crew members failed to secure standing equipment with hand brakes to prevent undesired movement.

PCF No. 4

The Brakeman fouled the track without protection, in an attempt to chock the wheels of Car AOK 28214 as it rolled toward him.

<u>PCF No. 5</u>

The ground was wet with accumulated snow, possibly affecting the Brakeman's footing.

REPORT:	FE-25-2007		
RAILROAD:	Burlington Northern Santa Fe Corporation (BNSF)		
LOCATION:	Bristol, Illinois		
DATE &TIME:	Dec. 28, 2007; 10:20 a.m., CST		
EVENT ¹ :	A Brakeman was fatally injured when caught between rail equipment during a switching operation.		
EMPLOYEE:	Craft:	Transportation and Engine	
	Occupation:	Brakeman	
	Age:	62 years	
	Length of Service:	36 years	
	Last Rules Training:	April 22, 2006	
	Last Safety Training:	April 22, 2006	
	Last Physical:	Unavailable	
	Last Relevant Efficiency Test:	Dec. 11, 2007	

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On Dec. 28, 2007, at 8:31 a.m., CST, the BNSF train crew for Assignment CH145 11 reported for duty at BNSF's Eola Yard located in Eola, Illinois. The CH145 11 assignment was performed by three crew members, a Locomotive Engineer, a Conductor and a Brakeman. The three crew members had been regularly assigned to this job for approximately six months. All crew members were off duty in excess of the statutory requirements and arrived on time at the Eola Yard office. Prior to beginning the day's work, the crew conducted a job safety briefing, discussing their assignments and how the work for the day would be performed.

After the job briefing, the crew members inspected their locomotive, BNSF 2456, gathered their cars, and performed a Class I air brake test. No exceptions were noted during the air brake test. CH145 11 departed Eola at about 9:30 a.m.

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.

CH145 11 consisted of a single locomotive and 15 loaded cars. The crew's first assignment was to pick up one empty car and deliver one loaded car to FE Wheaton. FE Wheaton had an industry spur track, connected to Main Track No. 1 at one end. This track was used to deliver and pull loaded and empty lumber railroad cars on a regular basis. The industry spur track had a .02 percent descending grade in a westward direction.

As CH145 11 approached FE Wheaton, the crew members conducted an additional job briefing in the locomotive cab. The crew agreed to pick up the empty railroad car located in FE Wheaton with the locomotive and head car of the train. The head car of the train was a loaded lumber car to be delivered to FE Wheaton.

After stopping, the Conductor and Brakeman exited the front door of their locomotive. The Brakeman secured the equipment, uncoupled the head car from the rest of the train, and then made his way to the industry spur track to inspect the gate and derail. The Conductor positioned himself at the switch and stopped the movement after the equipment had operated beyond the switch. The Conductor aligned the switch, instructed the Locomotive Engineer by radio to operate eastward, and instructed the Brakeman to take control of the move. The Brakeman coupled the loaded car to the empty car.

At this point, the Locomotive Engineer was operating BNSF 2456 westward, and the Brakeman was riding loaded Car ATW 268 out of FE Wheaton. The Conductor was positioned at the switch to the industry spur track.

The sky was cloudy, and the temperature was approximately 29° F. The ground was wet with accumulated snow.

THE ACCIDENT

The Conductor stopped the movement, operated the switch, and gave the Brakeman authority to control the move. The Brakeman got off of the equipment and instructed the Locomotive Engineer to operate eastward. The Brakeman operated the coupler lever to release the empty car and then stopped the movement to allow the empty car to roll freely and couple to the train on Main Track No. 1.

The Conductor aligned the switch for movement onto the spur track and gave the Brakeman authorization to control the move. The Brakeman rode the loaded car onto the FE Wheaton industry track. After moving a short distance, the Brakeman gave a rapid hand signal to stop. The Locomotive Engineer placed the train brakes into emergency to stop the movement. The locomotive and loaded car were fouling Main Track No. 1 at this time. The Brakeman got off the car and could no longer be seen by the Locomotive Engineer. The Brakeman instructed the Locomotive Engineer, via radio, to "Take em out-take em out [Operate westward]." The Locomotive Engineer responded via the radio, saying "I'm trying."

The Conductor noticed AOK 28214 was rolling westward at a slow speed and ran toward the car. The Conductor initially attempted to stop the car from rolling by chocking the lead axle with a

piece of wooden debris found near the tracks. The Conductor then ran around and boarded the east end of the rolling car. Concurrently, the train air brake system recovered, and the Locomotive Engineer operated westward.

The Conductor placed his hand on the wheel of the hand brake on AOK 28214, when the car increased speed and lunged forward. The Conductor jumped off the car and instructed the Locomotive Engineer, via radio, to stop. The Conductor came back around the north side and proceeded west, where he discovered the A end truck of AOK 28214 had derailed and the Brakeman was fatally injured.

The Conductor then broadcasted "May-Day, May-Day - The Brakeman was run over" via the radio to the Engineer. The Locomotive Engineer contacted the Dispatcher and requested emergency response personnel. The Conductor did not observe the Brakeman's actions prior to the impact of AOK 28214 and ATW 268. The Conductor did observe the Brakeman underneath the A end of AOK 28214. Emergency response personnel arrived at the scene of the incident at approximately 1:15 p.m., followed by the Yorkville Fire Department, the Yorkville Police Department, and the BNSF Police Department. The Kendall County Illinois Coroner's Certificate of Death indicated the Conductor was pronounced dead at the scene, which was at 10:23 a.m., CST.

POST-ACCIDENT INVESTIGATION

Federal Railroad Administration (FRA) Operating Practices inspectors arrived on the scene approximately four hours after the incident had occurred. An FRA Motive Power and Equipment inspector completed a mechanical inspection on the following cars: BN 625161, AOK 28214, and ATW 268. No mechanical exceptions were noted on the equipment. The following damage was noted on AOK 28214 as a result of the incident: a) sill step and hand hold damage on the A end right side; and b) an A end truck coil missing. The following damage was noted on ATW 268 as a result of the incident: a minor side swipe damage to the first six tie-down pulleys on the A end, right side.

Hours of service records were reviewed for the Locomotive Engineer, Conductor, and Brakeman for a period of 30 days prior to the incident. The Locomotive Engineer, Conductor, and Brakeman were regularly assigned to CH145 11. This assignment had an on-duty time of 8:31 a.m., CST, with a rest day on Sunday. The Conductor and Brakeman both received an off-duty period of 20 hours and 25 minutes prior to going on duty the day of the incident. The Locomotive Engineer received an off-duty period of 17 hours and 45 minutes prior to going on duty the day of the incident. After the incident, the Locomotive Engineer and Conductor were interviewed by BNSF management, Yorkville Police, and FRA.

This incident met the requirements for testing under Title 49, Part 219, Subpart C, Post-Accident Toxicological Testing. The Locomotive Engineer, Conductor, and Brakeman were tested under this authority. The results of these tests were negative.

Analysis and Conclusions

When Car AOK was cut off in motion and allowed to roll freely toward the secured equipment on Track No. 1, it failed to couple. However, neither the Brakeman nor Conductor was positioned at a location to verify whether or not AOK 28214 was coupled to the equipment.

The carrier had rules that should have been utilized to provide positive protection. For example, BNSF Air Brake and Train Handling (ABTH) Rule 102.1, Securing Equipment Against Undesired Movement, requires crew members to secure standing equipment with hand brakes to prevent undesired movement.

BNSF ABTH Rule 104.14, Determining Number of Hand Brakes, requires transportation employees to determine the number of hand brakes to be applied. The BNSF ABTH guideline chart requires any equipment weighing less than 1,000 tons on a 0 percent grade to have two hand brakes applied. The exact action the Brakeman took prior to being caught between equipment is not known.

BNSF Rule S-13.1.9 Chocking Cars, states "Do not chock moving rail equipment, except in an emergency, or when the equipment is in a repair facility."

Event recorder data from the BNSF 2456 was downloaded, reviewed, and analyzed by BNSF management. No exceptions were taken regarding inspections of the locomotive speed indicator, automatic brake valve, etc.

Efficiency testing records for the Conductor were reviewed for the period of January 1 to December 28, 2007. The Brakeman was tested a total of 15 times and one verbal failure was recorded under the General Code of Operating Rules (GCOR) 7.6, Securing Cars or Engines, which instructs employees not to depend on airbrakes to hold a train, engine, or cars in place when left unattended. The Engineer and Conductor are jointly responsible, through job briefings, to ensure equipment left unattended is properly secured and a sufficient number of hand brakes is applied to prevent movement. The training records for the Brakeman indicate he successfully completed an operating and safety rules class on April 22, 2006.

FRA uses an overall effectiveness rate of 77.5 percent as the baseline for fatigue analysis, which is equivalent to a blood alcohol content (BAC) of 0.05. At or above this baseline, fatigue is not considered as probable for any employee. Software sleep settings vary according to information obtained from each employee. If an employee does not provide sleep information, FRA uses the default software settings.

Investigators obtained fatigue-related information, including a 10-day work history, for the three employees involved in this incident, including the Locomotive Engineer, Conductor, and Brakeman assigned to Train CH145 11. FRA concluded fatigue was not probable for any of the employees.

Car AOK 28214 was cut off in motion, allowed to roll freely toward secured equipment on Main Track No. 1, and failed to couple. Crew members failed to ascertain if AOK 28214 had coupled

to the equipment or if a hand brake had been applied to AOK 28214. This condition permitted AOK 28214 to roll freely toward the industry spur switch occupied by locomotive BN 2456 and ATW 268. The Brakeman lost situational awareness, while attempting to chock the wheels of AOK 28214. As a result, when the locomotive and car operated west, the Brakeman was caught between AOK 28214 on Main Track No. 1 and ATW 268 on the spur track and was fatally injured. The Brakeman and Conductor's decision not to ascertain if AOK 28214 was properly secured, in non-compliance with BNSF ABTH Rule 102.1, was a contributing factor in this incident. The Brakeman's failure to maintain situational awareness, combined with the decision to foul tracks without proper protection (BNSF TY&E Safety Rules S-1.1 and S-13.1.3 C) was the primary cause of this incident.

APPLICABLE RULES

GENERAL CODE OF OPERATING RULES

FIFTH EDITION EFFECTIVE - April 3, 2005

- 7.1 Switching Safely and Efficiently: While switching, employees must work safely and efficiently and avoid damage to contents of cars, equipment, structures, or other property. Do not leave cars or engines where they will foul equipment on adjacent tracks or cause injury to employees riding on the side of a car or engine.
- **7.6** Securing Cars or Engines: Apply a sufficient number of hand brakes to prevent movement. If hand brakes are not adequate, block the wheels.
- 7.7 Kicking or Dropping Cars: Kicking or dropping cars is permitted only when it will not endanger employees, equipment, or contents of cars.

BNSF TY&E SAFETY RULES In Effect at 12:01 a.m. Oct. 30, 2005

S-1.1 Employees Fouling the Track: Employees must always be alert and expect the movement of trains, engines, cars or other moveable equipment at any time, on any track, and in either direction. Before fouling any track, employees have an individual responsibility to determine if it is safe to do so.

S-13.1.3 C.

Fouling Track: Do not walk between rails or foul the track, except when duties require it and proper protection is provided. Use caution during bad weather and when visibility is impaired.

S-13.1.9

Chocking Cars: When chocking cars, do not chock moving rail equipment, except in an emergency, or when the equipment is in a repair facility.

S-25.1 Job Safety Briefing: Hold a job safety briefing at the beginning of the job, and at any time during the job, as conditions change or new tasks are started.

BNSF SPECIAL INSTRUCTIONS All Subdivisions Number 15 In Effect at 12:01 a.m. Oct. 28, 2007

GCOR Rule 7.6 Securing Cars or Engines

The first paragraph is amended to read:

Do not depend on air brakes to hold a train, engine, or cars in place when left unattended. The Engineer and Conductor are jointly responsible, through job briefings, to ensure equipment left unattended is properly secured and a sufficient number of hand brakes are applied to prevent movement. If hand brakes are not adequate, block the wheels.

GCOR Rule 7.7 Kicking or Dropping Cars

The first paragraph is changed to read:

Kicking cars is permitted only when it will not endanger employees, equipment, or content of cars.

BNSF AIR BRAKE and TRAIN HANDLING RULES Number 4 In Effect at 12:01 a.m. April 29, 2007

- **102.1** Securing Equipment Against Undesired Movement: Crew members are responsible for securing standing equipment with hand brakes to prevent undesired movement. The air brake system must not be depended upon to prevent an undesired movement.
- 104.14 Determining Number of Hand Brakes: The number of hand brakes depends on:

Grade and adhesion; Number of loaded and empty cars; and Weather conditions (wind and temperature). Use the following to determine the minimum number of hand brakes to apply, when the number required is unknown and/or when testing of the hand brakes by releasing the air brakes is not possible:

Guideline Chart When Unable to Verify Required Hand Brakes by Release of Air Brakes; Grade (percent); and Weight of Equipment (tons).

APPENDICES A THROUGH I

(BAR AND PIE CHARTS)

APPENDIX A



APPENDIX B

2007 Railroad Employee Fatalities

By Craft and Position



APPENDIX C

2007 Railroad Employee Fatalities



2007 Railroad Employee Fatalities



APPENDIX D

2007 Railroad Employee Fatalities



APPENDIX E

2007 Railroad Employee Fatalities

By Type of Railroad



2007 Railroad Employee Fatalities



APPENDIX G

2007 Railroad Employee Fatalities Major Possible Contributing Factor Categories





2007 Railroad Employee Fatalities

Train Operation & Human Factors Involved



2007 Railroad Employee Fatalities

