Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2008-80

Burlington Northern Santa Fe (BNSF)
Chester, MT
October 23, 2008

Note that 49 U.S.C. §20903 provides that no part of an accident or incident report made by the Secretary of Transportation/Federal Railroad Administration under 49 U.S.C. §20902 may be used in a civil action for damages resulting from a matter mentioned in the report.

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File # HQ-2008-80

1.Name of Railroad Operating Train #1: BNSF Rwy Co. [BNSF]	1a. Alphabetic Code: BNSF	1b. Railroad Accident/Incident No.: MT1008-015
2.Name of Railroad Operating Train #2: N/A	2a. Alphabetic Code: N/A	2b. Railroad Accident/Incident No.: N/A
3.Name of Railroad Operating Train #3: N/A	3a. Alphabetic Code: N/A	3b. Railroad Accident/Incident No.: N/A
4.Name of Railroad Responsible for Track Maintenance: BNSF Rwy Co. [BNSF]	4a. Alphabetic Code: BNSF	4b. Railroad Accident/Incident No.: MT1008-015
5. U.S. DOT_AAR Grade Crossing Identification Number:	6. Date of Accident/Incident: Month 10 | Day 17 | Year 2008	7. Time of Accident/Incident: 08:45: ☑ AM ☐ PM

8. Type of Accident/Indicent *(single entry in code box)*: 1. Derailment; 2. Head on collision; 3. Rear end collision; 4. Side collision; 5. Raking collision; 6. Broken Train collision; 7. Hwy-rail crossing; 8. RR grade crossing; 9. Obstruction; 10. Explosion-detonation; 11. Fire/violent rupture; 12. Other impacts; 13. Other *(describe in narrative)* — Code: 13

9. Cars Carrying HAZMAT	10. HAZMAT Cars Damaged/Derailed	11. Cars Releasing HAZMAT	12. People Evacuated	13. Division
0	N/A	N/A	0	Montana

14. Nearest City/Town	15. Milepost *(to nearest tenth)*	16. State Abbr	16. State Code	17. County
Chester	1023.5	N/A	MT	LIBERTY

18. Temperature (F) *(specify if minus)*	19. Visibility *(single entry)* 1. Dawn 2. Day 3.Dusk 4.Dark — Code	20. Weather (single entry) 1. Clear 2. Cloudy 3. Rain 4. Fog 5.Sleet 6.Snow — Code	21. Type of Track 1. Main 2. Yard 3. Siding 4. Industry — Code
46 F	2	1	N/A

22. Track Name/Number	23. FRA Track Class (1-9, X) — Code	24. Annual Track Density *(gross tons in millions)*	25. Time Table Direction 1. North 2. South 3. East 4. West — Code
BNSF Right of Way	N/A	N/A	N/A

OPERATING TRAIN #1

26. Type of Equipment Consist *(single entry)* 1. Freight train 2. Passenger train 3. Commuter train 4. Work train 5. Single car 6. Cut of cars 7. Yard/switching 8. Light loco(s). 9. Maint./inspect.car A. Spec. MoW Equip. — Code	27. Was Equipment Attended? 1. Yes 2. No — Code	28. Train Number/Symbol
A	1	N/A

29. Speed *(recorded speed, if available)* R - Recorded E - Estimated — Code	30. Trailing Tons *(gross tonnage, excluding power units)*	31. Method(s) of Operation *(enter code(s) that apply)*	31a. Remotely Controlled Locomotive?
0 MPH — N/A	N/A	a. ATCS; b. Auto train control; c. Auto train stop; d. Cab; e. Traffic; f. Interlocking; g. Automatic block; h. Current of traffic; i. Time table/train orders; j.Track warrant control; k. Direct traffic control; l.Yard limits; m.Special instructions; n. Other than main track; o. Positive train control; p. Other *(Specify in narrative)* Code(s): p N/A N/A N/A N/A	0 = Not a remotely controlled; 1 = Remote control portable; 2 = Remote control tower; 3 = Remote control transmitter - more than one remote control transmitter: 0

32. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded *(yes/no)*
(1) First involved *(derailed, struck, etc)*	0	0	N/A
(2) Causing *(if mechanical cause reported)*	0	0	N/A

33. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box.

Alcohol	Drugs
0	0

34. Was this consist transporting passengers? (Y/N): N/A

35. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote
(1) Total in Train	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0

36. Cars	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0

37. Equipment Damage This Consist	38. Track, Signal, Way, & Structure Damage	39. Primary Cause Code	40. Contributing Cause Code
$0.00	$0.00	M599	N/A

Number of Crew Members

41. Engineer/ Operators	42. Firemen	43. Conductors	44. Brakemen
1	0	0	0

Length of Time on Duty

45. Engineer/Operator	46. Conductor
Hrs 7 Mi 30	Hrs 0 Mi 0

Casualties to:	47. Railroad Employees	48. Train Passengers	49. Other
Fatal	0	0	0
Nonfatal	0	0	0

50. EOT Device? 1. Yes 2. No	51. Was EOT Device Properly Armed? 1. Yes 2. No	52. Caboose Occupied by Crew? 1. Yes 2. No
N/A	N/A	N/A

OPERATING TRAIN #2

53. Type of Equipment Consist *(single entry)* 1. Freight train 2. Passenger train 3. Commuter train 4. Work train 5. Single car 6. Cut of cars 7. Yard/switching 8. Light loco(s). 9. Maint./inspect.car A. Spec. MoW Equip. — Code	54. Was Equipment Attended? 1. Yes 2. No — Code	55. Train Number/Symbol
N/A	N/A	N/A

56. Speed *(recorded speed, if available)* R - Recorded E - Estimated — Code	58. Method(s) of Operation *(enter code(s) that apply)*	58a. Remotely Controlled Locomotive?
0 MPH — N/A	a. ATCS; b. Auto train control; g. Automatic block; h. Current of traffic; m.Special instructions; n. Other than main track	0 = Not a remotely controlled; 1 = Remote control portable

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57. Trailing Tons *(gross tonnage, excluding power units)* N/A

c. Auto train stop; d. Cab; e. Traffic; f. Interlocking; i. Time table/train orders; j.Track warrant control; k. Direct traffic control; l.Yard limits; o. Positive train control; p. Other *(Specify in narrative)* Code(s): N/A N/A N/A N/A N/A

2 = Remote control tower
3 = Remote control transmitter - more than one remote control transmitter: N/A

59. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded *(yes/no)*
(1) First involved *(derailed, struck, etc)*	0	0	N/A
(2) Causing *(if mechanical cause reported)*	0	0	N/A

60. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box.

Alcohol	Drugs
N/A	N/A

61. Was this consist transporting passengers? (Y/N) N/A

62. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote
(1) Total in Train	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0

63. Cars	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0

64. Equipment Damage This Consist: $0.00

65. Track, Signal, Way, & Structure Damage: $0.00

66. Primary Cause Code: N/A

67. Contributing Cause Code: N/A

Number of Crew Members

68. Engineer/ Operators	69. Firemen	70. Conductors	71. Brakemen
0	0	0	0

Length of Time on Duty

72. Engineer/Operator: Hrs 0 Mi 0

73. Conductor: Hrs 0 Mi 0

Casualties to:	74. Railroad Employees	75. Train Passengers	76. Other
Fatal	0	0	0
Nonfatal	0	0	0

77. EOT Device? 1. Yes 2. No N/A

78. Was EOT Device Properly Armed? 1. Yes 2. No N/A

79. Caboose Occupied by Crew? 1. Yes 2. No N/A

OPERATING TRAIN #3

80. Type of Equipment Consist *(single entry)*: 1. Freight train; 2. Passenger train; 3. Commuter train; 4. Work train; 5. Single car; 6. Cut of cars; 7. Yard/switching; 8. Light loco(s); 9. Maint./inspect.car; A. Spec. MoW Equip. Code: N/A

81. Was Equipment Attended? 1. Yes 2. No Code: N/A

82. Train Number/Symbol: N/A

83. Speed *(recorded speed, if available)* Code: R - Recorded; E - Estimated N/A MPH 0

84. Trailing Tons *(gross tonnage, excluding power units)* N/A

85. Method(s) of Operation *(enter code(s) that apply)*: a. ATCS; b. Auto train control; c. Auto train stop; d. Cab; e. Traffic; f. Interlocking; g. Automatic block; h. Current of traffic; i. Time table/train orders; j.Track warrant control; k. Direct traffic control; l.Yard limits; m.Special instructions; n. Other than main track; o. Positive train control; p. Other *(Specify in narrative)* Code(s): N/A N/A N/A N/A N/A

85a. Remotely Controlled Locomotive?
0 = Not a remotely controlled
1 = Remote control portable
2 = Remote control tower
3 = Remote control transmitter - more than one remote control transmitter: N/A

86. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded *(yes/no)*
(1) First involved *(derailed, struck, etc)*	0	0	N/A
(2) Causing *(if mechanical cause reported)*	0	0	N/A

87. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box.

Alcohol	Drugs
N/A	N/A

88. Was this consist transporting passengers? (Y/N) N/A

89. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote
(1) Total in Train	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0

90. Cars	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0

91. Equipment Damage This Consist: $0.00

92. Track, Signal, Way, & Structure Damage: $0.00

93. Primary Cause Code: N/A

94. Contributing Cause Code: N/A

Number of Crew Members

95. Engineer/ Operators	96. Firemen	97. Conductors	98. Brakemen
0	0	0	0

Length of Time on Duty

99. Engineer/Operator: Hrs 0 Mi 0

100. Conductor: Hrs 0 Mi 0

Casualties to:	101. Railroad Employees	102. Train	103. Other
Fatal	0	0	0
Nonfatal	0	0	0

104. EOT 1. Yes 2. No N/A

105. Was EOT Device Properly 1. Yes 2. No N/A

106. Caboose Occupied by Crew? 1. Yes 2. No N/A

Highway User Involved

107. A. Auto; B. Truck; C. Truck-Trailer.; D. Pick-Up Truck; E. Van; F. Bus; G. School Bus; H. Motorcycle; J. Other Motor Vehicle; K. Pedestrian; M. Other *(spec. in narrative)* Code: N/A

108. Vehicle Speed *(est. MPH at impact)* N/A

109. *geographical)* 1.North 2.South 3.East 4.West Code: N/A

Rail Equipment Involved

111. Equipment 1.Train *(units pulling)*; 2.Train *(units pushing)*; 3.Train *(standing)*; 4.Car(s) *(moving)*; 5.Car(s) *(standing)*; 6.Light Loco(s) *(moving)*; 7.Light(s) *(standing)*; 8.Other *(specify in narrative)* Code: N/A

112. Position of Car Unit in 0

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110. Position	Code	113. Circumstance	Code
1.Stalled on Crossing 2.Stopped on Crossing 3.Moving Over Crossing 4. Trapped	N/A	1. Rail Equipment Struck Highway User 2. Rail Equipment Struck by Highway User	N/A
114a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? 1. Highway User 2. Rail Equipment 3. Both 4. Neither	N/A	114b. Was there a hazardous materials release 1. Highway User 2. Rail Equipment 3. Both 4. Neither	N/A

114c. State here the name and quantity of the hazardous materials released, if any.
N/A

115. Type Crossing Warning	1.Gates	2.Cantilever FLS	3.Standard FLS	4.Wig Wags	5.Hwy. traffic signals	6.Audible	7.Crossbucks	8.Stop signs	9.Watchman	10.Flagged by crew	11.Other *(spec. in narr.)*	12.None
Code(s)	N/A	N/A	N/A	N/A	N/A	N/A	N/A					

116. Signaled Crossing *(See instructions for codes)*	Code	117. Whistle Ban 1. Yes 2. No 3. Unknown	Code
	N/A		N/A

118. Location of Warning 1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach	Code	119. Crossing Warning with Highway Signals 1. Yes 2. No 3. Unknown	Code	120. Crossing Illuminated by Street Lights or Special Lights 1. Yes 2. No 3. Unknown	Code
	N/A		N/A		N/A

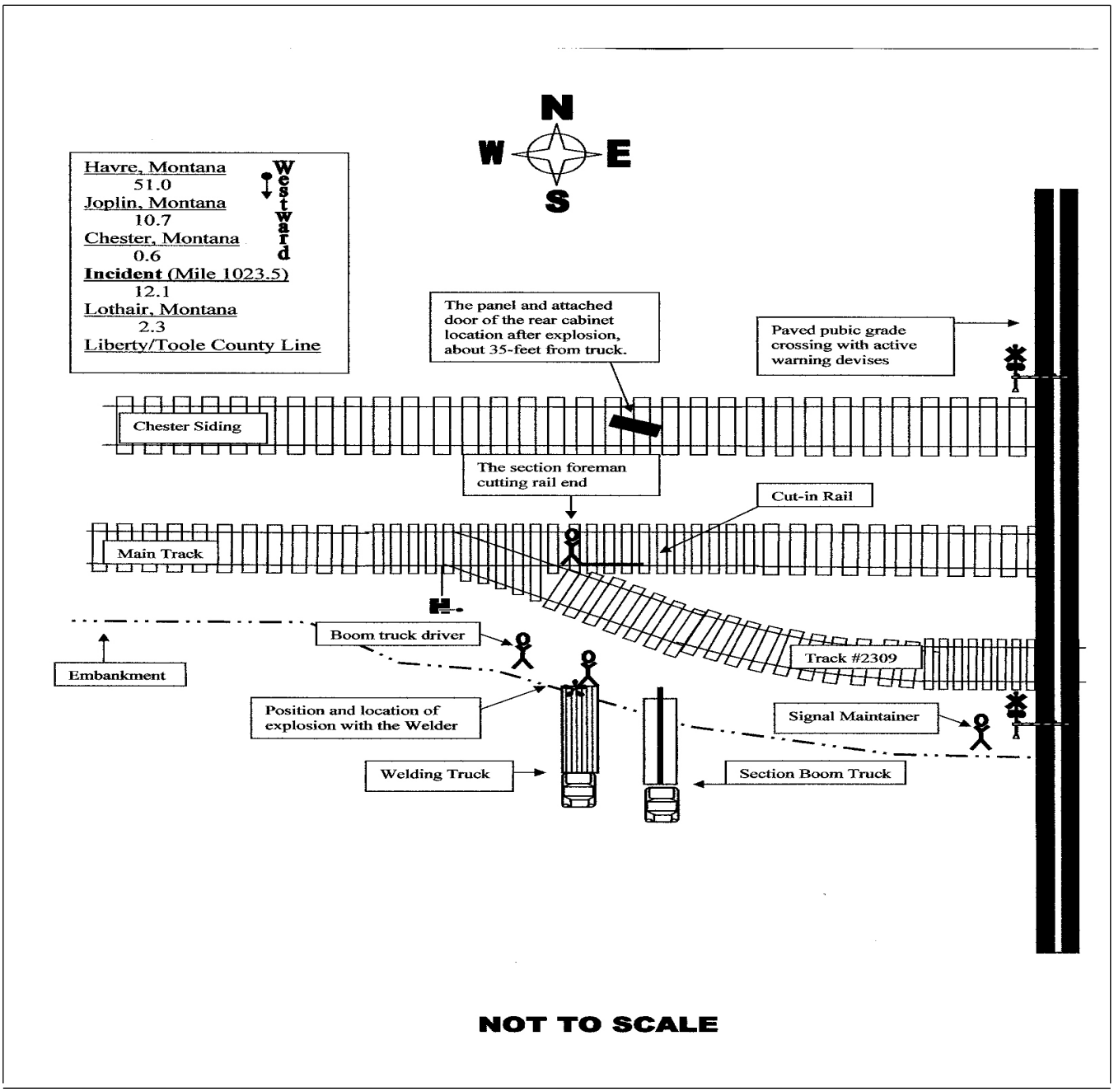
121. Age	122. Driver's Gender 1. Male 2. Female	Code	123. Driver Drove Behind or in Front of and Struck or was Struck by Second Train 1. Yes 2. No 3. Unknown	Code	124. Driver 1. Drove around or thru the Gate 2. Stopped and then Proceeded 3. Did not Stop 4. Stopped on Crossing 5. Other *(specify in narrative)*	Code
0		N/A		N/A		N/A

125. Driver Passed Highway Vehicle 1. Yes 2. No 3. Unknown	Code	126. View of Track Obscured by *(primary obstruction)* 1. Permanent Structure 2. Standing Railroad Equipment 3. Passing Train 4. Topography 5. Vegetation 6. Highway Vehicle 7. Other *(specify in narrative)* 8. Not obstructed	Code
	N/A		N/A

Casualties to:	Killed	Injured	127. Driver 1. Killed 2.Injured 3. Uninjured	Code	128. Was Driver in the Vehicle? 1. Yes 2. No	Code
				N/A		N/A
129. Highway-Rail Crossing Users	0	0	130. Highway Vehicle Property Damage *(est. dollar damage)*	0	131. Total Number of Highway-Rail Crossing Users *(include driver)*	0

132. Locomotive Auxiliary Lights? 1. Yes 2. No	Code	133. Locomotive Auxiliary Lights Operational? 1. Yes 2. No	Code
	N/A		N/A
134. Locomotive Headlight Illuminated? 1. Yes 2. No	Code	135. Locomotive Audible Warning Sounded? 1. Yes 2. No	Code
	N/A		N/A

136. DRAW A SKETCH OF ACCIDENT AREA INCLUDING ALL TRACKS, SIGNALS, SWITCHES, STRUCTURES, OBJECTS, ETC., INVOLVED.



137. SYNOPSIS OF THE ACCIDENT

On October 17, 2008, at 8:45 a.m. MST an explosion occurred resulting in an injury to a Burlington Northern Santa Fe (BNSF) Maintenance of Way (MOW) welder foreman. While performing normal track side duties on the BNSF right-of way, the welder foreman was severely injured by an explosion that occurred in the rear section of a BNSF work truck. The explosion occurred after an unintentional release of a flammable gas enriched with oxygen gas. This occurred on the BNSF Montana Division, Hi Line Subdivision, at milepost 1023.5 approximately half a mile west of Chester, Montana. The employee suffered two broken legs and lacerations to the feet requiring hospitalization.

The weather recorded by the BNSF at the time of the accident was clear, with the temperature of 46 degrees F.

The probable cause of the accident was M599 “other miscellaneous causes”. One or more employees failed to comply with a specific instruction as prescribed by the BNSF Engineering Instructions and the BNSF Track Welding Manual.

138. NARRATIVE

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On October 17, 2008, three Maintenance of Way (MOW) Roadway Workers, a welder foreman, section foreman, and a boom truck driver reported for duty in Chester, Montana, at 7:30 a.m. (MST). The welder foreman was assigned a company work truck for conducting welding procedures. The boom truck driver was assigned a company work truck used for track maintenance duties.

The welding truck has an electric welder for arc welding, propane and oxygen cylinders for gas welding, and other equipment (tools, safety equip, etc.) to assist in different welding procedures. The boom truck has a boom equipped for lifting heavy material and also has storage areas for tools and other track material.

After arriving at MOW headquarters in Chester, the section foreman, boom truck driver and welder were informed by the BNSF signal maintainer that a broken rail was discovered on the main track between the east and west siding switches at Chester.

The broken rail was located on the south rail just east of the heel of a frog in the west electric lock switch of Track 2309. The switch is located about half a mile west of the Chester section headquarters in tangent track with a .89 descending grade to the east with a service road leading to it from the BNSF right-of-way.

The section foreman and boom truck driver drove to the broken rail location in the boom truck and the welder foreman followed in the welding truck. The crew decided to cut in a replacement rail section by working from BNSF right-of-way. The driver of the boom truck backed the boom truck up as close as possible to the work site. The welder foreman backed the welding truck next to the boom truck after the replacement rail was installed.

THE ACCIDENT

After the replacement rail was bolted in place on the east end and the rail fasteners re-attached it was

determined to thermite weld the opposing rail joint (west end) because it was near the frog of the switch. Thermite welding is a process to weld the rail ends of a rail joint together eliminating the use of rail joint bars and bolts. The process includes using flammable gas and oxygen to preheat the rail ends.

The section foreman and boom truck driver had previously assisted the welder foreman thermite weld and were familiar with the process. The welder foreman helped place the abrasive rail saw on the rail to cut off a small section of a rail end for a required gap between the rail ends for the welding process. The rail saw is designed with a high speed chain saw motor with an abrasive circular wheel attached and is able to saw through the rail in approximately 2 ½-minutes. The sparks from the saw usually are thrown behind the saw between the operator's legs; sparks are also thrown forward in front of the operator.

The boom truck driver got onto the bed of the welding truck to help unload tools and supplies while the section foreman and welder foreman attached the saw to the rail. The boom truck driver opened a compartment which contained some tools and the propane and oxygen/acetylene gas cylinders. Knowing the welder foreman was going to use the gases to do the thermite weld, the boom truck driver observed the steel braided hoses which connect to the regulators were attached to the cylinders. He then opened both the propane and oxygen cylinders valves on the cylinders.

The section foreman was facing south and the welding truck was about 10 to 12 feet away while sawing the rail. Approximately half way through completion of cutting the rail an explosion occurred pushing him back several feet. Looking up he immediately saw the welder foreman staggering around near the rear of welding truck. There was also a fire in the right rear compartment of the truck. He raced to the boom truck to retrieve a fire extinguisher. Upon his return he observed the boom truck driver had already extinguished the fire and the welder foreman was lying on the ground near both trucks.

The boom truck driver was getting off the welding truck after he had opened the shut off valves on the cylinders as the explosion occurred. The welder foreman was approximately 15-feet away and to the side of the truck when the explosion occurred. The explosion occurred approximately one minute after the valves were opened,

Liberty County ambulance emergency personnel were called to attend to the welder foreman and to transport him to the hospital. The section foreman and boom truck driver were examined later at a local medical clinic with no injuries reported.

ANALYSIS AND CONCLUSIONS:

This accident did not meet the criteria for 49 CFR Part 219, Subpart C, Post Accident Toxicological Testing. No tests were performed.

On November 4, 2008, the FRA conducted an inspection of the welding truck and interviewed the section foreman and boom truck driver. The welder foreman was not interviewed due to his medical condition. The BNSF designed the welding truck with the flammable gasses in a compartment at the front portion of the truck bed. About 15-feet of steel braided hoses from the storage cylinders connect to the pressure regulators which are located in a compartment at the rear of the truck.

The torch hoses are mounted on a self retracting reel in a compartment located on the top of the truck bed and the torch handle is connected to the end of the reel hose. By design the torch handle hangs from the reel hose through a hole into a lower compartment about the width of the truck. It stores hydraulic hoses, wire cables for arc welding, and a compressed air hose, all of which are on self retractable reels.

To gain access to the lower compartment, a door is mounted to the top portion of a metal panel which is bolted onto the face of the compartment. This is the piece of the truck that struck and injured the welder foreman. The panel and attached door were found 35 feet north of the rear of the truck, between the north and south rails of the Chester Siding.

A BNSF welding supervisor conducted an inspection of the welding truck, welding appliances and the location of the explosion. The inspection revealed the regulators adjustment handles were screwed in and the torch handle valves were in the open position allowing the gasses to exit the torch handle into the lower compartment.

On November 5, 2008, the FRA interviewed the BNSF welding supervisor and reviewed the BNSF Engineering Instructions and Rules for Welding and Grinding and the BNSF Track Welding Manual for Track Welding Rules and Procedures.

One or more BNSF employees failed to comply with a specific instruction contained in the BNSF Track Welding Manual Rule 2.1.3 Bullet No. 5 "Release regulator adjusting screws when the cylinder valves are closed and before they are opened "and BNSF Engineering Instructions, Rule 11.17.2 "Setting Up and Shutting Down Oxy-Fuel Equipment."

The investigation revealed the shut off valves on the propane and oxygen cylinders on the welding truck were opened without releasing the pressure adjusting screws. The gasses passed through the regulators into the torch handle. The valves were open allowing the flammable gasses to fill into an enclosed compartment on the rear of the truck.

The explosion was apparently caused by sparks from the rail saw igniting gasses from the torch compartment when it was opened by the welder foreman.

FATIGUE ANALYSIS SECTION:

FRA obtained fatigue related information, for the 10-day period preceding this incident including the 10-day work history (on duty/off duty cycles) for all of the employees involved.

CONCLUSION:

Upon analysis of fatigue data information FRA concluded fatigue was not probable for any of the employees.

PROBABLE CAUSE:

The probable cause of the incident was M599 "other miscellaneous causes". One or more employees did not comply with a specific instruction as prescribed by the BNSF Engineering Instructions and the BNSF Track Welding Manual.