Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2006-85

Burlington Northern Santa Fe
New Salem, NE
October 27, 2006

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-2006-85

1.Name of Railroad Operating Train #1: BNSF Rwy Co. [BNSF]	1a. Alphabetic Code: BNSF	1b. Railroad Accident/Incident No.: NE1006117
2.Name of Railroad Operating Train #2: N/A	2a. Alphabetic Code: N/A	2b. Railroad Accident/Incident: N/A
3.Name of Railroad Responsible for Track Maintenance: BNSF Rwy Co. [BNSF]	3a. Alphabetic Code: BNSF	3b. Railroad Accident/Incident No.: NE1006117
4. U.S. DOT_AAR Grade Crossing Identification Number:	5. Date of Accident/Incident: Month 10 / Day 27 / Year 2006	6. Time of Accident/Incident: 04:55:00 ☑ AM ☐ PM

7. 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): 01

8. Cars Carrying HAZMAT	9. HAZMAT Cars Damaged/Derailed	10. Cars Releasing HAZMAT	11. People Evacuated	12. Division
11	3	0	0	Nebraska

13. Nearest City/Town	14. Milepost (to nearest tenth)	15. State Abbr	15. State Code	16. County
Salem	126.2	N/A	NE	RICHARDSON

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

21. Track Name/Number	22. FRA Track Class (1-9, X)	Code	23. Annual Track Density (gross tons in millions)	24. Time Table Direction 1. North 3. East	Code
Single Main		4	150		3

OPERATING TRAIN #1

25. 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: 1

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

27. Train Number/Symbol: MLINT UL 126

28. Speed (recorded speed, if available) R - Recorded E - Estimated: 47 MPH — Code: R

29. Trailing Tons (gross tonnage, excluding power units): 11655

30. 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): e, N/A, N/A, N/A, N/A

30a. 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: 0

31. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded (yes/no)
(1) First involved (derailed, struck, etc)	N/A	93	yes
(2) Causing (if mechanical cause reported)	0	0	N/A

32. 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

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

34. 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	4	0	0	0	0
(2) Total Derailed	0	0	0	0	0

35. Cars	Loade a. Freight	Loade b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	90	0	30	0	0
(2) Total Derailed	2	0	19	0	0

36. Equipment Damage — This Consist: 64192

37. Track, Signal, Way, & Structure Damage: 481200

38. Primary Cause Code: T204

39. Contributing Cause Code: T103

Number of Crew Members

40. Engineer/ Operators	41. Firemen	42. Conductors	43. Brakemen
N/A	0	1	0

Length of Time on Duty

44. Engineer/Operator: Hrs 5 Mi 55

45. Conductor: Hrs 5 Mi 55

Casualties to:	46. Railroad Employees	47. Train Passengers	48. Other
Fatal	0	0	0
Nonfatal	N/A	0	0

49. EOT Device? 1. Yes 2. No: 1

50. Was EOT Device Properly Armed? 1. Yes 2. No: 1

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

OPERATING TRAIN #2

52. 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

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

54. Train Number/Symbol: N/A

55. Speed (recorded speed, if available) R - Recorded E - Estimated: N/A MPH — Code: N/A

57. Method(s) of Operation (enter code(s) that apply): a. ATCS; b. Auto train control; g. Automatic block; h. Current of traffic; m.Special instructions; n. Other than main track

57a. Remotely Controlled Locomotive? 0 = Not a remotely controlled; 1 = Remote control portable

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56. Trailing Tons (gross tonnage, excluding power units)	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)	2 = Remote control tower 3 = Remote control transmitter - more than one remote control transmitter
N/A			N/A N/A N/A N/A N/A	N/A

58. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded (yes/no)	59. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box.	Alcohol	Drugs
(1) First involved (derailed, struck, etc)	N/A	N/A	N/A		N/A	N/A
(2) Causing (if mechanical cause reported)	N/A	N/A	N/A	60. Was this consist transporting passengers? (Y/N)	N/A	

61. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote	62. Cars	Loade a. Freight	Loade b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	N/A	N/A	N/A	N/A	N/A	(1) Total in Equipment Consist	N/A	N/A	N/A	N/A	N/A
(2) Total Derailed	N/A	N/A	N/A	N/A	N/A	(2) Total Derailed	N/A	N/A	N/A	N/A	N/A

63. Equipment Damage This Consist	64. Track, Signal, Way, & Structure Damage	65. Primary Cause Code	66. Contributing Cause Code
N/A	N/A	N/A	N/A

Number of Crew Members				Length of Time on Duty	
67. Engineer/ Operators N/A	68. Firemen N/A	69. Conductors N/A	70. Brakemen N/A	71. Engineer/Operator Hrs N/A Mi N/A	72. Conductor Hrs N/A Mi N/A

Casualties to:	73. Railroad Employees	74. Train Passengers	75. Other
Fatal	N/A	N/A	N/A
Nonfatal	N/A	N/A	N/A

76. EOT Device? 1. Yes 2. No	77. Was EOT Device Properly Armed? 1. Yes 2. No
N/A	N/A

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

Highway User Involved

79. Type — Code: N/A
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)

80. Vehicle Speed (est. MPH at impact): N/A

81. Direction geographical) — Code: N/A
1.North 2.South 3.East 4.West

82. Position — Code: N/A
1.Stalled on Crossing 2.Stopped on Crossing 3.Moving Over Crossing 4. Trapped

86a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? — Code: N/A
1. Highway User 2. Rail Equipment 3. Both 4. Neither

Rail Equipment Involved

83. Equipment — Code: N/A
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)

84. Position of Car Unit in Train: N/A

85. Circumstance — Code: N/A
1. Rail Equipment Struck Highway User
2. Rail Equipment Struck by Highway User

86b. Was there a hazardous materials release by — Code: N/A
1. Highway User 2. Rail Equipment 3. Both 4. Neither

86c. State here the name and quantity of the hazardous materials released, if any.
N/A

87. Type of 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					

88. Signaled Crossing Warning (See instructions for codes) — Code: N/A

89. Whistle Ban — Code: N/A
1. Yes 2. No 3. Unknown

90. Location of Warning — Code: N/A
1. Both Sides
2. Side of Vehicle Approach
3. Opposite Side of Vehicle Approach

91. Crossing Warning Interconnected with Highway Signals — Code: N/A
1. Yes 2. No 3. Unknown

92. Crossing Illuminated by Street Lights or Special Lights — Code: N/A
1. Yes 2. No 3. Unknown

93. Driver's Age: N/A

94. Driver's Gender — Code: N/A
1. Male 2. Female

95. Driver Drove Behind or in Front of Train and Struck or was Struck by Second Train — Code: N/A
1. Yes 2. No 3. Unknown

96. Driver — Code: N/A
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)

97. Driver Passed Standing Highway Vehicle — Code: N/A
1. Yes 2. No 3. Unknown

98. View of Track Obscured by (primary obstruction) — Code: N/A
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

101. Casulties to Highway-Rail Crossing Users	Killed	Injured
	N/A	N/A

99. Driver Was — Code: N/A
1. Killed 2.Injured 3. Uninjured

100. Was Driver in the Vehicle? — Code: N/A
1. Yes 2. No

102. Highway Vehicle Property Damage (est. dollar damage): N/A

103. Total Number of Highway-Rail Crossing Users (include driver): N/A

104. Locomotive Auxiliary Lights? — Code: N/A
1. Yes 2. No

105. Locomotive Auxiliary Lights Operational? — Code: N/A
1. Yes 2. No

106. Locomotive Headlight Illuminated? — Code: N/A
1. Yes 2. No

107. Locomotive Audible Warning Sounded? — Code: N/A
1. Yes 2. No

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

109. SYNOPSIS OF THE ACCIDENT

An eastbound BNSF Railway Company (BNSF) freight train derailed on October 27, 2006, at 4:55 a.m., Central Daylight Time (CDT). The accident occurred 2 miles north of Salem, Nebraska, at milepost (MP) 126.2, on the BNSF Nebraska Division, St. Joseph Subdivision. As a result, 21 cars were derailed.

There were no injuries or hazardous material spills as a result of the derailment. Total damages reported for the derailment totaled $545,392.

At the time of the accident, it was dark and overcast with a temperature of 43°F.

The cause of the derailment has been determined as a broken field weld. Poor track support was a contributing factor.

110. NARRATIVE

Circumstances Prior to the Accident

The crew of Train Symbol M LINTUL1-26A included a locomotive engineer and a conductor. They first went on duty at 11 p.m., October 26, 2006, at the BNSF Hobson Yard in Lincoln, Nebraska. This was the away-from-home terminal for the crew members, and both received more than the statutory off-duty period, prior to reporting for duty.

Their assigned freight train consisted of 4 locomotives, 90 loads, and 30 empties. The train, including locomotives, was 7,201 feet long with 11,655, trailing tons. The train was destined for Tulsa, Oklahoma.
The train received a Class I air brake test and the two-way end-of-train device was armed and tested at Lincoln, Nebraska, on October 26, 2006. The train departed Lincoln, Hobson Yard at 2:29 a.m., October 27, 2006.

There were no changes made to the consist after departing Lincoln prior to the derailment.

The railroad timetable direction of the train was east. The geographic direction was southeast. Timetable directions are used throughout this report. As the eastbound train approached the accident area, the locomotive engineer was seated at the controls on the south side of the leading locomotive. The conductor was seated on the north side of the leading locomotive.

The track at and leading up to, the point of derailment (POD) is on a near level grade. It is constructed of 132-pound CWR rail on concrete ties. There are no rail joints, turnouts, bridges, or culverts in the immediate area. A ballast deck bridge with wood crossties is located 350 feet east of the POD. The bridge did not incur any structural damage.

The Accident

The train was being operated at 47 mph approaching the accident area. At the time of the accident, the train was also traveling at 47 mph. Speeds were recorded by the event recorder of the controlling locomotive. The maximum authorized speed for this train is 50 mph, as designated in the current BNSF Timetable No. 5.

At 4:55 a.m., October 27, 2006, Train Symbol M LINTUL1-26A was traveling eastward at milepost 126.2. The engineer was seated at the control stand and the conductor was seated at his normal position in the cab when a trainline initiated emergency air brake application brought the head-end of the train to a stop at milepost 123.8. The accident resulted in the derailment of 21 cars located throughout the rear 32 cars of the train. All but the rear most five cars in the consist remained upright and coupled to the train. These five cars derailed and became separated from the consist, initiating an emergency application of the train's air brakes. The rear two cars of this five-car block left the track and rolled over onto their sides. The weather was dark and overcast with a temperature of 43 degrees Fahrenheit. Visibility was unrestricted approaching the accident area.

Analysis and Conclusions

Analysis

BNSF and FRA personnel responded to the accident. BNSF and FRA conducted inspections of the track and equipment following the accident. A download of the

event recorder was analyzed by the BNSF and FRA to determine if train handling contributed to the cause of the accident.

Post-accident toxicology testing of the crew was not conducted. BNSF officials determined that the accident was not a "major" accident as defined by Federal regulations.

The last ultrasonic rail detection test through this area was on October 17, 2006, and the last geometry car survey was on August 25, 2006, with a nonfederal defect found at milepost 126.146. The track was inspected by hi-rail vehicle on October 26, 2006, with no exceptions taken in the area. Track inspection records revealed that this track was inspected well within the required frequency the prior month before the accident, with no federal exceptions noted in the immediate area. However, records indicate that several railroad deviations have been noted in the near past.

The BNSF track inspector was questioned regarding the track conditions in the derailment area. He stated that a slow order had been removed the day before the derailment. He placed a slow order starting at MP 123.4 and ending at MP 129.2 for several low spots including a spot at MP 126.2. This slow order was placed in effect on October 24, 2006.

In a statement provided to the BNSF, the track inspector stated that he had a surface gang raise several locations starting at MP 123.5, MP 126.2 and MP 129.1. He stated that when he inspected this track on October 26, 2006, he found that the track at MP 126.2 had a 1/4- inch crown and no surface deviations. He continued on and measured the other locations. He then removed the restriction at that time.

A suspect piece of rail (at a Orogo-thermit field weld) was recovered from the accident and sent to the BNSF's Technical Research and Development Lab in Topeka, Kansas, for analysis. The weld was a Orgotherm Standard kit weld for 132-lb rail and was made on February 10, 2006. This rail had leaving head batter which is consistent with this type of derailment cause.

According to the BNSF Lab Report Project ID 2006102001, Subheading Visual Observations states, "The rail and weld fractured into 4 pieces. Receiving head batter was found on the rail head. Examination of the fracture faces revealed the initial fracture occurred along the edge of the weld in the heat affected zone and originated at the rail base. At the failure origin in the rail base, a small fatigue crack was found. The fatigue crack was 1 inch in length and extended 1/16 inch into the rail. The fracture than propagated up the web breaking off a portion of the rail head and then propagated in several directions."

Subheading Track Geometry states, "The geometry car and track history was reviewed using the Engineering Visual Information Center (EVIC). This territory was tested 3 times in the past year, including one test that was performed 7 days after the derailment. Several red and yellow tags were found near the point of derailment. This territory appeared to have several cross level issues."

Subheading Conclusion/Recommendation states, "Failure of the rail was caused by a fatigue crack originating from the rail base in the head affected zone of the weld. Fatigue cracks originating in the rail base are indications of poor track support issues. Review of the geometry car data revealed several cross level and cant issues near the weld."

Post accident evaluation of the equipment made by BNSF and FRA produced no suspicious mechanical components.

BNSF and FRA analyzed readouts from the last dragging equipment and warm bearing detector. The dragging equipment detector located at milepost 126.4 produced no alarms. The warm bearing detector located at milepost 134.8 produced no alarms.

The probability of fatigue for both employees is based on the results from the fatigue analysis software (FAST) used to correlate an individual's level of fatigue based on the prior 10-day work/rest cycle of the employee.

Conclusion

The data reviewed from the event recorder ruled out train handling as a cause. There were no marks found on the rail or ties prior to the derailment. There were also no track components, i.e. bridges, turnouts, grade crossings in the point of derailment (POD) area that could have contributed to the cause. There was no grade and curvature in the area that would have contributed to the cause. No marks were found on the flange or tread of the wheels of the nonderailed equipment that made it over this area to suggest they encountered anything prior to the derailment.

All findings and post accident analysis substantiates a broken field weld.

Probable Cause and Contributing Factors

Although fatigue was found to be "probable" for both the engineer and conductor of the train involved in this derailment, it is not considered to be a contributing factor in the cause.

It was determined by the FRA that a contributing factor was T103 "poor track support" and the primary cause of this derailment is T204 "broken field weld."