



***Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2005-30***

***BNSF Railway (BNSF)/Canadian Pacific (CP)
St. Paul, Minnesota
April 6, 2005***

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 # <u>HQ-2005-30</u>	
1. Name of Railroad Operating Train #1 BURLINGTON NORTHERN SANTA FE CORPORATION				1a. Alphabetic Code BNSF		1b. Railroad Accident/Incident No. TC0405102	
2. Name of Railroad Operating Train #2 SOO Line RR Co. [SOO]				2a. Alphabetic Code SOO		2b. Railroad Accident/Incident 190779	
3. Name of Railroad Responsible for Track Maintenance: BNSF Rwy Co. [BNSF]				3a. Alphabetic Code BNSF		3b. Railroad Accident/Incident No. TC0405102	
4. U.S. DOT_AAR Grade Crossing Identification Number				5. Date of Accident/Incident Month Day Year 04 06 2005		6. Time of Accident/Incident 11:00:00 <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM	
7. Type of Accident/Incident (single entry in code box)							
1. Derailment		4. Side collision		7. Hwy-rail crossing		10. Explosion-detonation	
2. Head on collision		5. Raking collision		8. RR grade crossing		11. Fire/violent rupture	
3. Rear end collision		6. Broken Train collision		9. Obstruction		12. Other impacts	
						13. Other (describe in narrative) 01	
8. Cars Carrying HAZMAT 11		9. HAZMAT Cars Damaged/Derailed 11		10. Cars Releasing HAZMAT 0		11. People Evacuated 0	
						12. Division TWIN CITIES	
13. Nearest City/Town ST. PAUL				14. Milepost (to nearest tenth) 0.8		15. State Abbr Code N/A MN	
16. County RAMSEY							
17. Temperature (F) (specify if minus) 41 F		18. Visibility (single entry) Code 2		19. Weather (single entry) Code 2		20. Type of Track Code 1	
1. Dawn 3. Dusk		2. Day 4. Dark		1. Clear 3. Rain 5. Sleet		2. Main 3. Siding	
				2. Cloudy 4. Fog 6. Snow		2. Yard 4. Industry	
21. Track Name/Number MAIN TRK HOFFMAN AVE				22. FRA Track Code Class (1-9, X) 3		23. Annual Track Density (gross tons in millions) 41.2	
						24. Time Table Direction Code 3	
						1. North 3. East	
OPERATING TRAIN #1							
25. Type of Equipment Consist (single entry)		1. Freight train 4. Work train 7. Yard/switching		A. Spec. MoW Equip. Code 1		26. Was Equipment Attended? Code 1	
2. Passenger train 5. Single car 8. Light loco(s).		3. Commuter train 6. Cut of cars 9. Maint./inspect.car				27. Train Number/Symbol VPTLB LU303	
28. Speed (recorded speed, if available) Code R - Recorded 22 MPH R		30. Method(s) of Operation (enter code(s) that apply)				30a. Remotely Controlled Locomotive?	
E - Estimated		a. ATCS g. Automatic block m. Special instructions				0 = Not a remotely controlled	
		b. Auto train control h. Current of traffic n. Other than main track				1 = Remote control portable	
		c. Auto train stop i. Time table/train orders o. Positive train control				2 = Remote control tower	
		d. Cab j. Track warrant control p. Other (Specify in narrative) Code(s)				3 = Remote control transmitter - more than one	
29. Trailing Tons (gross tonnage, excluding power units) 5870		e. Traffic k. Direct traffic control				remote control transmitter	
		f. Interlocking l. Yard limits				0	
		e N/A N/A N/A N/A					
31. Principal Car/Unit		a. Initial and Number		b. Position in Train		c. Loaded (yes/no)	
(1) First involved (derailed, struck, etc)		N/A		38		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 0 Drugs 0	
						33. Was this consist transporting passengers? (Y/N) N	
34. Locomotive Units		a. Head End		Mid Train		Rear End	
		b. Manual		c. Remote		d. Manual c. Remote	
(1) Total in Train 2		0		0		0	
(2) Total Derailed 0		0		0		0	
						35. Cars	
						a. Freight b. Pass. c. Freight d. Pass. e. Caboose	
						(1) Total in Equipment Consist 78 0 0 0 0	
						(2) Total Derailed 7 0 0 0 0	
36. Equipment Damage This Consist 176212		37. Track, Signal, Way, & Structure Damage 446000		38. Primary Cause Code T102		39. Contributing Cause Code N/A	
Number of Crew Members				Length of Time on Duty			
40. Engineer/Operators N/A		41. Firemen 0		42. Conductors 1		43. Brakemen 0	
						44. Engineer/Operator Hrs 3 Mi 15	
						45. Conductor Hrs 3 Mi 15	
Casualties to:		46. Railroad Employees		47. Train Passengers		48. Other	
Fatal 0		0		0		0	
Nonfatal N/A		0		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 4. Work train 7. Yard/switching		A. Spec. MoW Equip. Code 1		53. Was Equipment Attended? Code 1	
2. Passenger train 5. Single car 8. Light loco(s).		3. Commuter train 6. Cut of cars 9. Maint./inspect.car				54. Train Number/Symbol HH43	
55. Speed (recorded speed, if available) Code R - Recorded 10 MPH R		57. Method(s) of Operation (enter code(s) that apply)				57a. Remotely Controlled Locomotive?	
E - Estimated		a. ATCS g. Automatic block m. Special instructions				0 = Not a remotely controlled	
		b. Auto train control h. Current of traffic n. Other than main track				1 = Remote control portable	

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56. Trailing Tons (gross tonnage, excluding power units)		4740		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) e N/A N/A N/A N/A		2 = Remote control tower 3 = Remote control transmitter - more than one remote control transmitter		0			
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.							
(1) First involved (derailed, struck, etc)		ITLX44 064		15		yes						Alcohol 0		Drugs 0	
(2) Causing (if mechanical cause reported)		0		0		N/A		60. Was this consist transporting passengers? (Y/N)						N	
61. Locomotive Units		a. Head End		Mid Train b. Manual c. Remote		Rear End d. Manual c. Remote		62. Cars		Loade a. Freight b. Pass.		Empty c. Freight d. Pass.		e. Caboose	
(1) Total in Train		5		0 0		0 0		(1) Total in Equipment Consist		27 0		35 0		0 0	
(2) Total Derailed		0		0 0		0 0		(2) Total Derailed		1 0		12 0		0 0	
63. Equipment Damage This Consist		183873		64. Track, Signal, Way, & Structure Damage		315261		65. Primary Cause Code		T102		66. Contributing Cause Code		N/A	
Number of Crew Members						Length of Time on Duty									
67. Engineer/ Operators		1		68. Firemen 0		69. Conductors 1		70. Brakemen 0		71. Engineer/Operator Hrs 4 Mi 0		72. Conductor Hrs 4 Mi 0			
Casualties to:		73. Railroad Employees		74. Train Passengers		75. Other		76. EOT Device? 1. Yes 2. No		1 1		77. Was EOT Device Properly Armed? 1. Yes 2. No		1 1	
Fatal		0		0		0		78. Caboose Occupied by Crew? 1. Yes 2. No						2	
Nonfatal		0		0		0									
Highway User Involved						Rail Equipment Involved									
79. Type C. Truck-Trailer. F. Bus J. Other Motor Vehicle A. Auto D. Pick-Up Truck G. School Bus K. Pedestrian B. Truck E. Van H. Motorcycle M. Other (spec. in narrative)						83. Equipment 3. Train (standing) 6. Light Loco(s) (moving) 1. Train(units pulling) 4. Car(s)(moving) 7. Light(s) (standing) 2. Train(units pushing) 5. Car(s)(standing) 8. Other (specify in narrative)									
80. Vehicle Speed (est. MPH at impact) 0						81. Direction geographical 1. North 2. South 3. East 4. West									
82. Position 1. Stalled on Crossing 2. Stopped on Crossing 3. Moving Over Crossing 4. Trapped						85. Circumstance 1. Rail Equipment Struck Highway User 2. Rail Equipment Struck by Highway User									
86a. 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						86b. Was there a hazardous materials release by 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 1. Gates 4. Wig Wags 7. Crossbucks 10. Flagged by crew 2. Cantilever FLS 5. Hwy. traffic signals 8. Stop signs 11. Other (spec. in narr.) Warning 3. Standard FLS 6. Audible 9. Watchman 12. None						88. Signaled Crossing Warning (See instructions for codes)									
Code(s) N/A N/A N/A N/A N/A N/A						89. Whistle Ban 1. Yes 2. No 3. Unknown									
90. Location of Warning 1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach						91. Crossing Warning Interconnected with Highway Signals 1. Yes 2. No 3. Unknown									
93. Driver's Age 0						94. Driver's Gender 1. Male 2. Female									
95. Driver Drove Behind or in Front of Train and Struck or was Struck by Second Train 1. Yes 2. No 3. Unknown						96. Driver 1. Drove around or thru the Gate 4. Stopped on Crossing 2. Stopped and then Proceeded 5. Other (specify in narrative) 3. Did not Stop									
97. Driver Passed Standing Highway Vehicle 1. Yes 2. No 3. Unknown						98. View of Track Obscured by (primary obstruction) 1. Permanent Structure 3. Passing Train 5. Vegetation 7. Other (specify in narrative) 2. Standing Railroad Equipment 4. Topography 6. Highway Vehicle 8. Not obstructed									
101. Casualties to Highway-Rail Crossing Users Killed Injured 0 0						99. Driver Was 1. Killed 2. Injured 3. Uninjured 102. Highway Vehicle Property Damage (est. dollar damage) 0									
104. Locomotive Auxiliary Lights? 1. Yes 2. No						105. Locomotive Auxiliary Lights Operational? 1. Yes 2. No									
106. Locomotive Headlight Illuminated? 1. Yes 2. No						107. Locomotive Audible Warning Sounded? 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

On April 6, 2005, at 11 a.m. CDT, an eastbound BNSF Railway Company (BNSF) mixed freight Train Symbol V-PTLBU3-03 derailed. The accident occurred on the BNSF Twin Cities Division, St. Paul Subdivision, on Main Track No. 1 in St. Paul, Minnesota, at BNSF Milepost 0.8. The lead wheels of the lead truck on a loaded auto rack, ETTX 904043, climbed the high rail of the spiral in a 3-degree 11-minute right hand curve and was dragged approximately 1.5 miles. At BNSF Milepost 429.1, the derailed car sideswiped westbound Soo Line Railroad Company (SOO)¹ Train Symbol HH43 at Control Point Hoffman Avenue and derailed 13 cars of the SOO train. There was no release of hazardous materials and no evacuation.

The total estimated damages were \$1,121,346. Estimated damage for the BNSF was \$176,212 for equipment and \$446,000 for track and structure. The estimated damage for the SOO was \$183,873 for equipment and \$315,261 for track and structure.

There were no injuries to the train crew employees.

At the time of the accident the weather was overcast, with a temperature of 41 °F.

The probable cause of the accident was a difference in cross level between two points within 62 feet in a spiral, which resulted in an unprotected surface condition, causing the first wheel set of ETTX 904043 to climb over the high rail of the spiral.

¹ The Soo Line Railroad Company (SOO) was acquired by the Canadian Pacific Railway (CP) and is being operated as a separate entity for legal purposes.

110. NARRATIVE

The following information was obtained from an investigation that was conducted by the Federal Railroad Administration.

CIRCUMSTANCES PRIOR TO THE ACCIDENT

The crew of the BNSF eastbound train consisted of a locomotive engineer, student engineer, and conductor. They went on duty at 7:45 a.m., April 6, 2005, at Northtown Yard, which is located in Fridley, MN. Northtown Yard was the away terminal for the crew members. Prior to reporting for duty, all three employees received the required statutory off-duty period. The locomotive engineer was seated at the controls located on the right (south) side of the leading locomotive. The conductor and engineer student were seated opposite the engineer on the left (north) side of the locomotive cab.

The BNSF train was scheduled to travel from Fridley to Dayton Bluff, MN, a distance of approximately 15 miles. Before departing Northtown Yard, the train crew had a 1,000 mile inspection and initial air brake test performed by the Northtown carmen. They departed on Main Track No. 2 and received a roll-by inspection from the carmen. This mixed freight train consisted of two locomotives, 78 loads, and zero empties. It was 7,312 feet long, with 5,870 trailing tons.

At BNSF Milepost 7.9, the train went into emergency at 10 a.m. The entire train was inspected and a loose air hose was tightened. After the repair, the crew proceeded east after talking to the East Hump Dispatcher. The BNSF dispatcher then advised the train crew that they would be crossing over from Main Track No. 2 to Main Track No. 1, at Mississippi Street. After crossing over, the train proceeded to Hoffman Avenue Control Point on Main Track No. 1 on a clear (proceed) signal indication.

Approaching the point of derailment (POD) in the direction of the train movement, there are in succession, a 2-degree 41-minute right hand curve approximately 900 feet in length, a tangent approximately 600 feet in length, a 2-degree 22-minute left hand curve approximately 700 feet in length, a tangent approximately 600 feet in length, and then a 3-degree 11- minute left hand curve at the POD approximately 900 feet in length.

Approaching the point of collision (POC) from the west there are, in succession, a 3-degree 11- minute left hand curve approximately 900 feet in length, a tangent approximately 1,300 feet in length, a 2-degree 22-minute right hand curve approximately 300 feet in length, a tangent approximately 300 feet in length, a 3-degree 15-minute right hand curve approximately 600 feet in length, a tangent approximately 2,200 feet in length, a 2-degree 0-minute right hand curve approximately 600 feet in length, a tangent approximately 300 feet in length, and a 1-degree 40-minute right hand curve leading to tangent track at the POC with the SOO.

At the POC, the BNSF train was operating on Main Track No. 1 under the authority of a Traffic Control System. The BNSF Twin Cities Timetable No. 2, effective 0800 Wednesday, November 17, 2004, authorizes a maximum speed of 30 mph for both freight and passenger operations, FRA Class 3 track. The timetable and geographic direction of the train was east.

In the accident area, the SOO train (HH43) was operating through the crossovers from the SOO lead to SOO Main Track No. 2 under a clear (proceed) signal indication of a traffic control system. The SOO's Timetable No. 5, effective 0001 Sunday, April 3, 2005, authorizes a maximum speed of 10 mph for both freight and passenger operations, FRA Class 1 track. The timetable and geographic direction of the train was west. The HH43 consisted of 27 loads and 35 empties. It was 3,909 feet long, with 4,740 trailing tons.

THE ACCIDENT

As the eastbound BNSF train approached the POD, it was operating at a recorded speed of 22 mph. The train continued operating for a distance of approximately 1.5 miles with the leading set of wheels on ETTX 904043 derailed. At BNSF Milepost 429.1, the derailed car impacted SOO HH43, which was proceeding west

through the Hoffman Avenue crossovers, and derailed 13 cars of HH43. The BNSF mileposts change at Seventh Street from Milepost 0.0 to Milepost 430.0 to reflect a new line segment number. The SOO milepost at Hoffman Avenue Control Point is designated as 408.8.

According to the locomotive event recorder printout, a train line induced emergency brake application occurred at 11:05 a.m. At that point, the BNSF trainmaster, who aided the train crew during the air hose incident, notified the crew that there was a derailed car in their train. A total of seven loaded auto racks in the BNSF train derailed. The derailed cars were the 35th through the 41st car from the head end of the train.

The SOO conductor attempted to call the BNSF dispatcher using established emergency procedures, but the BNSF train had also gone into emergency and managed to reach the dispatcher first. Once the BNSF crew had relayed their information to the dispatcher, the SOO crew provided the dispatcher with their information. The SOO conductor then proceeded to walk back to the site of the collision, and found 12 cars of his train on their side, with another one damaged. Further examination revealed that 11 of the cars were tank cars containing Anhydrous Ammonia residue, but none were compromised.

ANALYSIS AND CONCLUSION

This accident met the criteria prescribed in Title 49 CFR, Part 219, Subpart C, Post Accident Toxicological Testing. The BNSF trainmaster secured the locomotive event recorder and transported the crew to a local hospital for mandatory FRA drug and alcohol screening. The test results were negative.

The BNSF train crew had no idea that their train had struck the adjacent SOO train at the Hoffman Avenue Control Point. The BNSF train crew first became aware of the derailment when their train went into emergency just prior to the intermediate signal. They stopped the train and immediately reported the derailment to the dispatcher. The crew was then instructed by the BNSF trainmaster to secure their train.

An inspection of the data printout from the BNSF leading locomotive event recorder indicated no unusual events related to train handling. An inspection of the data printout from the SOO leading locomotive event recorder indicated no unusual events related to train handling.

The initial derailed car, ETTX 904043, was inspected by an FRA Motive Power and Equipment Inspector. No concerns or exceptions to the FRA Railroad Car Safety Standards were noted. FRA Signal & Train Control and Hazardous Materials Inspectors were also on the site during the investigation and took no exceptions. The anhydrous ammonia tank cars were equipped with shelf-couplers, which was a major cause of the 12 cars tipping over as an entire group.

At the POD, the investigation revealed that there was a difference in cross level within 62 feet in a spiral. This was found after taking field measurements under load. These measurements revealed a deviation of 2 13/16 inches in 46 1/2 feet. At the POD, the track was constructed of 136 pound continuous welded rail (CWR). The ballast was extremely fouled with dirt under a light covering of ballast. One side of the track structure was in the shade and the other in direct sunlight. FRA inspectors concluded that throughout the few days prior to this accident, the frost was coming out of the grade and sub-grade, but at a different rate relative to the shaded and sunlight side of the track structure.

The investigation also revealed that the BNSF had operated their geometry test car through the area on October 11, 2004, and issued a yellow tag for cross level concerns at milepost 0.8. The recorded measurement on that date was 2 inches. On December 14, 2004, the BNSF operated their Gage Restraint Measurement System (GRMS) car through the same area and again issued a yellow tag for cross level concerns. The measurement at that time was 2 3/4 inches. An exploded view of the geometry strip chart produced by the BNSF track geometry car during the last test, which occurred on October 11, and the geometry strip chart produced by the GRMS car on December 14, was obtained and reviewed. FRA inspectors also examined a two-color strip chart for cross level which compared the results obtained by the GRMS and the track geometry car. The results showed progressive cross level degradation at the POD.

The BNSF Engineering Instructions Field Manual revised on November 1, 2004, Chapter 5, titled Track Geometry, Section 5.5.4 states "The track inspector or track supervisor must field check Yellow Tag defects on tracks not more than seven days behind the track geometry car or STAR (GRMS) car test. Table 5-1 reflects BNSF track geometry maintenance limits (same as Yellow Tag limits). The track inspector or track supervisor must closely monitor these locations, arrange for repair as soon as possible, and place a slow order when necessary to ensure the safe movement of trains."

During the interview with the track inspector, he stated that there were so many "Red Tags" found during these tests and that the priority was the "Red Tags." The BNSF could not produce a written record showing that the "Yellow Tag" items were inspected and monitored as required. On April 5, 2005, the BNSF track inspector had inspected this area and noted no defective conditions. This was the last carrier track inspection documented prior to the accident on April 6, 2005.

PROBABLE CAUSE

The FRA determined that the probable cause of the accident was a difference in cross level between two points within 62 feet in a spiral, which resulted in an unprotected surface condition, causing the first wheel set of ETTX 904043 to climb over the high rail of the spiral.

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