Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2005-49

Burlington Northern Santa Fe (BNSF)
Hoxie, Arkansas
June 24, 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 # HQ-2005-49

1.Name of Railroad Operating Train #1	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
BNSF Rwy Co. [BNSF]	BNSF	SF065121
2.Name of Railroad Operating Train #2	2a. Alphabetic Code	2b. Railroad Accident/Incident
N/A	N/A	N/A
3.Name of Railroad Responsible for Track Maintenance:	3a. Alphabetic Code	3b. Railroad Accident/Incident No.
BNSF Rwy Co. [BNSF]	BNSF	SF065121

4. U.S. DOT_AAR Grade Crossing Identification Number	5. Date of Accident/Incident (Month / Day / Year)	6. Time of Accident/Incident
	06 / 24 / 2005	04:35: ☐ 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) — Code: 01

8. Cars Carrying HAZMAT	9. HAZMAT Cars Damaged/Derailed	10. Cars Releasing HAZMAT	11. People Evacuated	12. Division
18	4	4	0	Springfield

13. Nearest City/Town	14. Milepost (to nearest tenth)	15. State Abbr	15. State Code	16. County
Hoxie	400.3	N/A	AR	LAWRENCE

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
98 F		2		1		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	72		1

OPERATING TRAIN #1

25. Type of Equipment Consist (single entry)	A. Spec. MoW Equip.	Code	26. Was Equipment Attended? 1. Yes 2. No	Code	27. Train Number/Symbol
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		1		1	MMEM TUL 123

28. Speed (recorded speed, if available) — R - Recorded; E - Estimated 54 MPH — Code: R

29. Trailing Tons (gross tonnage, excluding power units): 7117

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	1	N/A
(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
0	0

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

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	4	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	45	0	39	0	0
(2) Total Derailed	21	0	1	0	0

36. Equipment Damage This Consist	37. Track, Signal, Way, & Structure Damage	38. Primary Cause Code	39. Contributing Cause Code
1584313	94000.00	T109	N/A

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	45. Conductor
Hrs 9 Mi 35	Hrs 9 Mi 35

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

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

OPERATING TRAIN #2

52. Type of Equipment Consist (single entry)	A. Spec. MoW Equip.	Code	53. Was Equipment Attended? 1. Yes 2. No	Code	54. Train Number/Symbol
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		N/A		N/A	N/A

55. Speed (recorded speed, if available) — R - Recorded; E - Estimated 0 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): 0

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): 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

58. 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

59. 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

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
(1) Total in Train	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0

62. Cars	Loade a. Freight	Loade 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

63. Equipment Damage This Consist: 0

64. Track, Signal, Way, & Structure Damage: 0

65. Primary Cause Code: N/A

66. Contributing Cause Code: N/A

Number of Crew Members

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

Length of Time on Duty

71. Engineer/Operator: Hrs 0 Mi 0

72. Conductor: Hrs 0 Mi 0

Casualties to:	73. Railroad Employees	74. Train Passengers	75. Other
Fatal	0	0	0
Nonfatal	0	0	0

76. EOT Device? 1. Yes 2. No: N/A

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

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

Highway User Involved

79. Type: 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

80. Vehicle Speed (est. MPH at impact): 0

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

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

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. Code: N/A

Rail Equipment Involved

83. 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

84. Position of Car Unit in Train: 0

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

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

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:

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

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

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

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

93. Driver's Age: 0

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

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

96. 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: N/A

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

98. 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

101. Casulties to Highway-Rail Crossing Users	Killed	Injured
	0	0

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

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

102. Highway Vehicle Property Damage (est. dollar damage): 0

103. Total Number of Highway-Rail Crossing Users (include driver): 0

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

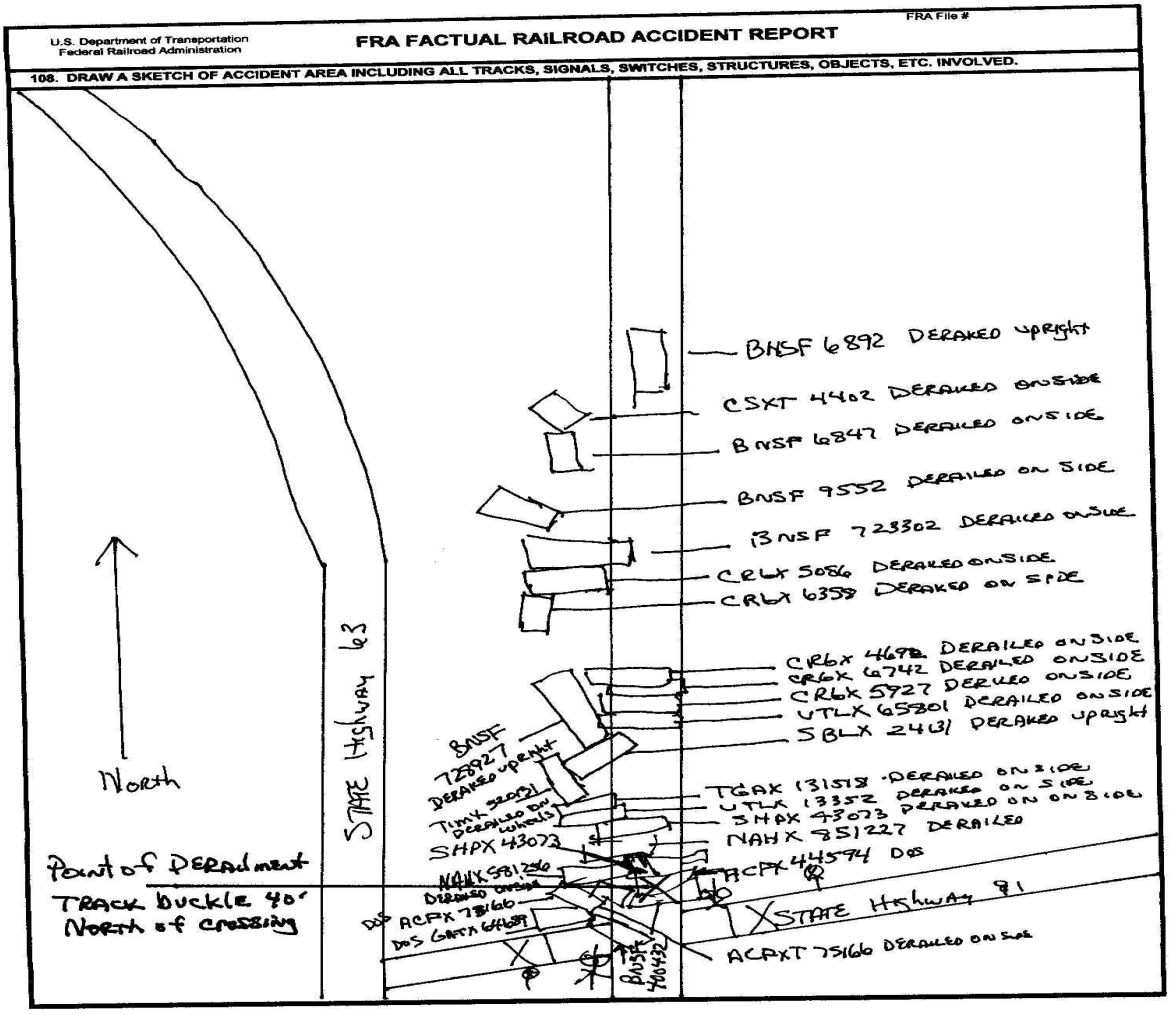
105. Locomotive Auxiliary Lights Operational? 1. Yes 2. No. Code: N/A

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

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

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

HQ-49-2005.jpg



109. SYNOPSIS OF THE ACCIDENT

On June 24, 2005 at 4:35 p.m. CST, BNSF northbound freight train symbol M-MEMTUL1-23A (BNSF 6892) derailed at Milepost 400.3 near Hoxie, Arkansas on the BNSF single main track on the BNSF Thayer South Subdivision.

The method of operation is Traffic Control System (CTC) territory on single main track. The MEMTUL1-23A, traveling northbound on the single main track encountered a track buckle at Milepost 400.3. Train M-MEMTUL1-23A event recorders, on BNSF 6892 indicates the engineer initiated an emergency train air brake application at Milepost 400.34 at 56 m.p.h. and immediately impacted and derailed on the track buckle.

There were non life threatening injuries to the train crew and hazardous materials were released.

The weather at the time of the derailment was clear and 98 ° F.

Track, Structure and Equipment Damage:

Equipment	$1, 584,313.00
Track	$94,000.00
Lading	$385,980.00
Clearing	$175,000.00

The accident was caused by a track buckle, which was caused by the carriers failure to follow its own CWR procedures regarding continuous welded rail while performing work in this area.
This track buckle was reported by both members of the train crew of the MEMTUL1-23A and when FRA arrived at the accident site and spoke with the BNSF Roadmaster, he also said the derailment was caused by a track buckle. During the course of my investigation, I discovered two private citizens who had crossed over this grade crossing and had seen that there was a problem with the track prior to the derailment. They described the tracks as being out of alignment in a V shape.

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 train MEMTUL1-23A North included a locomotive engineer and a conductor. They first went on duty at 7 a.m., CST at Memphis, Tennessee. This was an away from home terminal for both crew members, and both crew members received more than the statutory off duty period, prior to reporting for duty.

This freight train consisted of 4 locomotives, 45 loaded, and 39 empty cars of several varieties. It was 5,121 feet long with 7,117 trailing tons. The train was scheduled to travel to Tulsa, Oklahoma with cars to be set out and picked up while en route. The train received an initial terminal air brake test prior to proceeding northward toward Thayer, Missouri. EOT device number 23648 was attached to the end of the train on car SHPX 221220, and was charged as required prior to the trains departure. The train departed the Memphis yards at 7:45 a.m.

The crew stopped the train and removed cars at one location while en route. They removed a total of 14 cars, and performed an intermediate terminal train air brake test at this location prior to proceeding toward Thayer, Missouri.

As the northbound train approached the accident area, the locomotive engineer was at the controls on the east side of the leading locomotive and the conductor was seated on the west side in the rear of the two seat configurations.

Approaching the accident area from the south, the track is a tangent for more than eight miles and the grade is virtually zero for more than five miles. The point of derailment was just north of the Highway 91 grade crossing at BNSF Milepost 400.3. Continuing north from the point of the derailment, the track is a tangent for approximately 7,100 feet where it goes into a left-hand curve. The grade is virtually zero from the point of derailment until you reach Milepost 396.6.

The railroad timetable direction of the train was north. Timetable directions are used throughout this report.

The Accident

The train was being operated at 56 mph approaching the accident area. As the northbound train approached state Highway 91, the engineer observed a track buckle from a distance of approximately 1, 000 feet, and initiated an emergency train air brake application. Train speed was reduced by 2 mph before the engines struck the track buckle.

At the time of the derailment the train was being operated at 54 mph. Both speeds were recorded by the event recorder of the controlling locomotive. The maximum speed for all trains is 60 mph, as designated in the current BNSF Springfield Division Thayer South Timetable # 5.

4 locomotives and 22 cars were derailed. There were non life threatening injuries to the train crew and no injuries to the general public. The lead locomotive derailed but stayed upright, the following 3 locomotives derailed on their sides. The 22 cars following the locomotives were also derailed. 4 of these cars contained Hazardous Materials, from which there was a release into the environment. 28,500 gallons of phosphoric acid, 4,600 gallons of potassium hydroxide and several thousand gallons of diesel fuel from the 3 locomotives that derailed on their sides was released. The derailment did impact a waterway, and forced the closure of Arkansas State highways 63 and 91. There was no evacuation.

Locomotives

CSXT 4402	Loss of 2,000 Gallons of Diesel Fuel
BNSF 6847	Loss of 2,000 Gallons of Diesel Fuel
BNSF 9252	Loss of 2,000 Gallons of Diesel Fuel

Hazmat Cars

SBLX 24131	STCC 4935230	Loss of 4,600 Gallons of Potassium Hydroxide
TGAX 121030	STCC 4930247	Loss of 8,500 Gallons Phosphoric Acid
TGAX 131518	STCC 4930247	Loss of 10,000 Gallons of Phosphoric Acid
UTLX 13352	STCC 4930247	Loss of 10,000 Gallons of Phosphoric Acid

At the time of the derailment it was daylight and clear. The ambient temperature was 98 degrees. The rail temperature was 127 degrees.

Analysis and Conclusions

Analysis

The engineer and conductor both reported a track buckle was the reason they derailed. This was also reported to FRA by BNSF maintenance of Way officers as the cause of the accident. The track was inspected by FRA on 6-25-05 and no exceptions were taken at that time near the derailment site. This section of track was inspected by BNSF maintenance of way personnel at 1p.m. on 6-24-05 with no exceptions taken. The location of the actual derailment was a chronic soft spot that had always been hard to hold the surface, according to the railroad. FRA's past track inspection's document fouled ballast conditions near this location. The BNSF geometry test car marked this location as having 5 yellow tag locations in March of 2005 for geometry conditions.
In April of 2005, the BNSF had performed extensive maintenance work in this area, which included undercutting the track, installing ties where they were needed, and surfacing the track. Highway 91 grade crossing was removed at that time and undercut and surfaced through, but was later reinstalled. This subdivision operates approximately seventy trains, with the majority of the tonnage moving south. This figure is currently 49 MGT south and 23 MGT north.
The BNSF has Chief Engineering Instructions which tell all of its Maintenance of Way employees how to work on its tracks under all conditions, and it has specific sections on the prevention of track buckles. BNSF even has a separate manual called the Track Stability Field Manual. These instructions are issued to all M/W employees, from the laborers and track inspectors to the General Directors and Chief Engineers who implement them. The sections dealing with continuously welded rail are required by the Federal Track Safety Standards.
The railroad conducted its own accident investigation and put its findings in a report known as the 3P. FRA s obtained a copy of this document and its conclusions were that among other things, they had failed to follow their own procedures. This supports FRA's findings of the cause of the accident.

Conclusions

The BNSF was not in compliance with their own, or applicable Federal Track Safety Standards.

Applicable Rules

FRA

Failure to comply with Federal Track Safety Standards Rule 213.119.02 which states, Failure to Comply With Written CWR Procedures. This regulation states in part that the carrier will at a minimum have . . .

Each track owner with track constructed of CWR shall have in effect and comply with written procedures which address the installation, adjustment, maintenance and inspection of CWR, and a training program for the application of those procedures, which shall be submitted to the Federal Railroad Administration by March 22, 1999. FRA reviews each plan for compliance with the following:

(a) Procedures for the installation and adjustment of CWR which include
(1) Designation of a desired rail installation temperature range for the geographic area in which the CWR is located; and
(2) De-stressing procedures/methods which address proper attainment of the desired rail installation temperature range when adjusting CWR.
(b) Rail anchoring or fastening requirements that will provide sufficient restraint to limit longitudinal rail and crosstie movement to the extent practical, and specifically addressing CWR rail anchoring or fastening patterns on bridges, bridge approaches, and at other locations where possible longitudinal rail and crosstie movement associated with normally expected train-induced forces, is restricted.
(c) Procedures which specifically address maintaining a desired rail installation temperature range when cutting CWR including rail repairs, in-track welding, and in conjunction with adjustments made in the area of tight track, a track buckle, or a pull-apart. Rail repair practices shall take into consideration existing rail temperature so that;
(1) When rail is removed, the length installed shall be determined by taking into consideration the existing rail temperature and the desired rail installation temperature range; and
(2) Under no circumstances should rail be added when the rail temperature is below that designated by paragraph (a)(1) of this section, without provisions for later adjustment.
(h) The track owner shall prescribe recordkeeping requirements necessary to provide an adequate history of track constructed with CWR. At a minimum, these records must include:
(1) Rail temperature, location and date of CWR installations. This record shall be retained for at least one year; and
(2) A record of any CWR installation or maintenance work that does not conform with the written procedures. Such record shall include the location of the rail and be maintained until the CWR is brought into conformance with such procedures.
(i) As used in this section –
(1) Adjusting/De-stressing means the procedure by which a rail's temperature is re-adjusted to the desired value. It typically consists of cutting the rail and removing rail anchoring devices, which provides for the necessary expansion and contraction, and then re-assembling the track.
(2) Buckling Incident means the formation of a lateral mis-alinement sufficient in magnitude to constitute a deviation from the Class 1 requirements specified in §213.55 of this part. These normally occur when rail temperatures are relatively high and are caused by high longitudinal compressive forces.
(5) Disturbed Track means the disturbance of the roadbed or ballast section, as a result of track maintenance or any other event, which reduces the lateral or longitudinal resistance of the track, or both.
(7) Rail Anchors means those devices which are attached to the rail and bear against the side of the crosstie to control longitudinal rail movement. Certain types of rail fasteners also act as rail anchors and control longitudinal rail movement by exerting a downward clamping force on the upper surface of the rail base.
(8) Rail Temperature means the temperature of the rail, measured with a rail thermometer.
(9) Tight/Kinky Rail means CWR which exhibits minute alinement irregularities which indicate that the rail is in a considerable amount of compression.
(10) Train-induced Forces means the vertical, longitudinal, and lateral dynamic forces which are generated during train movement and which can contribute to the buckling potential.
(11) Track Lateral Resistance means the resistance provided to the rail/crosstie structure against lateral displacement.
(12) Track Longitudinal Resistance means the resistance provided by the rail anchors/rail fasteners and the ballast section to the rail/crosstie structure against longitudinal displacement.

BNSF

BNSF Track Stability Field Manual November 1, 2004 Section 5
Longitudinal Stresses Caused by Maintenance Activities, page 34

Significantly disturbing the ballast section (undercutting, surfacing, performing heavy tie renewals, installing concrete ties, etc.) along a segment of track can make

the rail shift in response to imposed thermal and mechanical forces.

Lining curves and surfacing over crests and through sags can change the amount of rail present in a given length of track and therefore change the neutral temperature of the rail. (The location of the derailment had been a chronic soft spot for surface prior to undercutting)

Section 6 page 35
Maintenance Performed Near Fixed Objects
Certain maintenance activities significantly disturb the ballast section and can alter or lower the neutral temperature. These activities include:

- Undercutting
- Performing tie renewal activities
- Lining a curve inward
- Surfacing track in a sag
- Correcting sharp alignment on a segment of tangent track

a. When performing the above work, be sure to de-stress rail for a distance of 400 feet away from a fixed object.

- Track is on or near the bottom of a grade of 2 percent or greater and traffic exceeds 10 MGT per year.
- A curve is lined in within 400 feet of a fixed object.
- Chronic sub grade problems exist

While the Highway 91 grade crossing was removed during the initial undercutting phase, it was reinstalled almost immediately, making it a fixed object well before stabilization had been complete. This section, nor any other sections of track behind the under cutter gangs were de-stressed.

The BNSF Chief Engineers Instructions are identical to the Track Stability Field manual in regards to this topic.

Probable Cause & Contributing Factors

This accident occurred because the carrier failed to follow their own written CWR procedures regarding continuous welded rail, and failed to ensure that its employees followed these rules and procedures.
T109 Track alignment irregular (buckled/sunkink)