



***Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch***

***Accident Investigation Report
HQ-2013-12***

***BNSF Railway Company (BNSF)
Tehachapi, CA
May 20, 2013***

Note that 49 U.S.C. §20903 provides that no part of an accident or incident report, including this one, 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.

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 BNSF Railway Company	1a. Alphabetic Code BNSF	1b. Railroad Accident/Incident No. CA0513115
2. Name of Railroad Operating Train #2 Union Pacific Railroad Company	2a. Alphabetic Code UP	2b. Railroad Accident/Incident No. 0513LA020

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance Union Pacific Railroad Company	1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. 0513LA020
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident 5/20/2013	4. Time of Accident/Incident 2:45 AM
5. Type of Accident/Incident Rear End Collision		
6. Cars Carrying HAZMAT 6	7. HAZMAT Cars Damaged/Derailed 0	8. Cars Releasing HAZMAT 0
		9. People Evacuated 0
10. Subdivision Mojave		
11. Nearest City/Town Tehachapi	12. Milepost (to nearest tenth) 352.5	13. State Abbr. CA
		14. County KERN
15. Temperature (F) 64 °F	16. Visibility Dark	17. Weather Clear
18. Type of Track Main		
19. Track Name/Number Single Main Track	20. FRA Track Class Freight Trains-40, Passenger Trains-60	21. Annual Track Density (gross tons in millions) 77.8
		22. Time Table Direction North

OPERATING TRAIN #1

1. Type of Equipment Consist: Freight Train				2. Was Equipment Attended? Yes		3. Train Number/Symbol VCLORIC116					
4. Speed (recorded speed, if available) R - Recorded E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 4396		6a. Remotely Controlled Locomotive? 0 = Not a remotely controlled operation 1 = Remote control portable transmitter 2 = Remote control tower operation 3 = Remote control portable transmitter - more than one remote control transmitter				Code 0		
6. Type of Territory Signalization: <u>Signaled</u> Method of Operation/Authority for Movement: <u>Signal Indication</u> Supplemental/Adjunct Codes: <u>Q, N/A</u>											
7. Principal Car/Unit (1) First Involved (derailed, struck, etc.)		a. Initial and Number BNSF7337	b. Position in Train 1	c. Loaded (yes/no) no	8. If railroad employee(s) tested for drug/ alcohol use, enter the number that were positive in the appropriate box.			Alcohol 0	Drugs 0		
(2) Causing (if mechanical, cause reported)		0	0		9. Was this consist transporting passengers?			No			
10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train b. Manual c. Remote		Rear End d. Manual e. Remote		11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded a. Freight b. Pass.		Empty c. Freight d. Pass.		e. Caboose
(1) Total in Train	3	0	0	0	0	(1) Total in Equipment Consist	61	0	0	0	0
(2) Total Derailed	3	0	0	0	0	(2) Total Derailed	11	0	0	0	0
12. Equipment Damage This Consist 885287		13. Track, Signal, Way & Structure Damage 0									
14. Primary Cause Code H222 - Automatic block or interlocking signal displaying other than a stop indication - failure to comply.*											
15. Contributing Cause Code H605 - Failure to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal.											
Number of Crew Members						Length of Time on Duty					
16. Engineers/Operators 1		17. Firemen 0		18. Conductors 1		19. Brakemen 0		20. Engineer/Operator Hrs: 8 Mins: 0		21. Conductor Hrs: 8 Mins: 0	
Casualties to:		22. Railroad Employees		23. Train Passengers		24. Others		25. EOT Device? No		26. Was EOT Device Properly Armed? N/A	
Fatal		0		0		0		27. Caboose Occupied by Crew? No			
Nonfatal		0		0		0					
28. Latitude				29. Longitude							

OPERATING TRAIN #2

1. Type of Equipment Consist: Freight Train				2. Was Equipment Attended? Yes		3. Train Number/Symbol MWCRVB-19					
4. Speed (recorded speed, if available) R - Recorded E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 5635		6a. Remotely Controlled Locomotive? 0 = Not a remotely controlled operation 1 = Remote control portable transmitter 2 = Remote control tower operation 3 = Remote control portable transmitter - more than one remote control transmitter				Code 0		
6. Type of Territory Signalization: <u>Signaled</u> Method of Operation/Authority for Movement: <u>Signal Indication</u> Supplemental/Adjunct Codes: <u>Q, N/A</u>											
7. Principal Car/Unit		a. Initial and Number	b. Position in Train	c. Loaded (yes/no)	8. If railroad employee(s) tested for drug/ alcohol use, enter the number that were positive in the appropriate box.		Alcohol	Drugs			
(1) First Involved <i>(derailed, struck, etc.)</i>		UP5477	105	no			0	0			
(2) Causing <i>(if mechanical, cause reported)</i>		0	0		9. Was this consist transporting passengers?		No				
10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train		Rear End		11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded		Empty		
		b. Manual	c. Remote	d. Manual	e. Remote		a. Freight	b. Pass.	c. Freight	d. Pass.	e. Caboose
(1) Total in Train	4	0	0	1	0	(1) Total in Equipment Consist	31	0	69	0	0
(2) Total Derailed	0	0	0	1	0	(2) Total Derailed	0	0	4	0	0
12. Equipment Damage This Consist 30516			13. Track, Signal, Way & Structure Damage 475264								
14. Primary Cause Code H222 - Automatic block or interlocking signal displaying other than a stop indication - failure to comply.*											
15. Contributing Cause Code H605 - Failure to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal.											
Number of Crew Members						Length of Time on Duty					
16. Engineers/Operators		17. Firemen		18. Conductors		19. Brakemen		20. Engineer/Operator		21. Conductor	
1		0		1		0		Hrs: 9 Mins: 20		Hrs: 9 Mins: 20	
Casualties to:		22. Railroad Employees		23. Train Passengers		24. Others		25. EOT Device?		26. Was EOT Device Properly Armed?	
Fatal		0		0		0		No		No	
Nonfatal		0		0		0		27. Caboose Occupied by Crew?		N/A	
28. Latitude				29. Longitude							

CROSSING INFORMATION

Highway User Involved

Rail Equipment Involved

1. Type		5. Equipment	
2. Vehicle Speed (<i>est. mph at impact</i>)	3. Direction (<i>geographical</i>)	6. Position of Car Unit in Train	
4. Position of Involved Highway User		7. Circumstance	
8a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? N/A		8b. Was there a hazardous materials release by N/A	
8c. State here the name and quantity of the hazardous material released, if any.			
9. Type of Crossing Warning 1. Gates 4. Wig wags 7. Crossbucks 10. Flagged by crew 2. Cantilever FLS 5. Hwy. traffic signals 8. Stop signs 11. Other (<i>spec. in narr.</i>) 3. Standard FLS 6. Audible 9. Watchman 12. None N/A		10. Signaled Crossing Warning	11. Roadway Conditions N/A
12. Location of Warning N/A		13. Crossing Warning Interconnected with Highway Signals N/A	14. Crossing Illuminated by Street Lights or Special Lights N/A
15. Highway User's Age	16. Highway User's Gender	17. Highway User Went Behind or in Front of Train and Struck or was Struck by Second Train	18. Highway User
19. Driver Passed Standing Highway Vehicle		20. View of Track Obscured by (<i>primary obstruction</i>)	
Casualties to:	Killed	Injured	21. Driver was
23. Highway-Rail Crossing Users	0	0	22. Was Driver in the Vehicle?
24. Highway Vehicle Property Damage (<i>est. dollar damage</i>)	25. Total Number of Vehicle Occupants (<i>including driver</i>)		
26. Locomotive Auxiliary Lights? N/A		27. Locomotive Auxiliary Lights Operational? N/A	
28. Locomotive Headlight Illuminated? N/A		29. Locomotive Audible Warning Sounded? N/A	

SYNOPSIS

On Monday, May 20, 2013 at approximately 2:45 am Pacific Daylight Time (PDT), a northbound BNSF Railway (BNSF) freight train VCLORIC116 struck the rear end of a stopped Union Pacific Railroad (UP) freight train MWCRVB19 at a recorded speed of 19 miles per hour. The collision occurred on UP's Mojave Subdivision milepost 352.5 on single main track near the town of Tehachapi, CA located approximately 40 miles south of Bakersfield, CA. Movements in this part of the railroad are governed by centralized traffic control (CTC).

As a result of the collision, three locomotives and 11 loaded auto railcars derailed on the BNSF train and one DPU locomotive and four empty cars derailed on the UP train. Equipment damages were reported as \$885,287 for the BNSF train and \$30,516 for the UP train. Damages to UP track and signal equipment were reported as \$475,264. There were no injuries to the crew members on either train and no release of hazardous materials.

The weather at the time of the accident was dark and clear with a temperature of 64 degrees Fahrenheit.

The probable cause of the accident was failing to comply with an automatic block or interlocking signal displaying other than a stop indication. A contributing factor was failing to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal. It was also concluded that fatigue was a probable contributing factor in this accident.

NARRATIVE

Circumstances Prior to the Accident

The BNSF and UP timetables differ in orientation, i.e. BNSF directions in the Mojave Subdivision are listed west and east while UP directions in the same subdivision are listed north and south. However, the geographic direction is north and will be used in this report.

BNSF Train VCLORIC116 (Train #1)

The crew of northbound BNSF train VCLORIC116 (Train #1), consisting of a locomotive engineer and a conductor, reported for duty at 6:45 p.m. May 19, 2013, at their away from home terminal in Barstow, CA. Prior to reporting for duty, the engineer and conductor had 13 hours and no minutes of off-duty time. Their assigned train was made up of three leading locomotives, 61 loads, no empties, 4,396 tons for 5,728 feet in length, and was scheduled to travel between Barstow and Bakersfield, CA.

After reporting for duty, the conductor and engineer reviewed their track warrants, train consist, updated notices and held a job briefing to discuss any and all pertinent information affecting the movement of their train. After their job briefing they boarded a van and were transported to their assigned train that was staged on BNSF main track #3.

The crew performed a Class 2 set and release air brake test and departed Barstow, CA under signal indication at approximately 8:03 p.m. They traveled off the Mojave Connector track traveling west on the BNSF Mojave Subdivision from Barstow to Mojave, CA then onto the UP Mojave Subdivision from Mojave to Marcel, CA heading north. Both crew members stated that their train held the main track for approximately 95 miles from their originating station to the vicinity of the accident with no work en route.

Approaching the derailment site, the engineer was seated at the controls on the east side of the leading locomotive and the conductor on the west side. The conductor stated that he was observing signals and writing the aspect of those signals on his signal awareness form.

The track profile requires the engineer to transition into dynamic breaking when heading timetable west/geographic north. The engineer stated that he was in dynamic braking and traveling at a recorded speed of 19 miles per hour and had recently activated his whistle for a private road crossing. Both crew members said the train was handling normally with no exceptions.

At approximately 2:30 a.m., Train #1 was stopped at CP North Marcel, milepost 353.0, after receiving a red (stop) signal indication. After an approximately 10 minute wait, Train #1 received a flashing red (restricted speed) signal indication and proceeded north towards Walong, CP SP351.

UP Train MWCRVB19 (Train #2)

The crew of northbound UP freight train MWCRVB19 (Train #2), consisting of a locomotive engineer and a conductor, reported for duty at 9:25 p.m. May 19, 2013 at their home terminal in Colton, CA. Prior to reporting for duty, the engineer had 12 hours and 35 minutes of off-duty time and the conductor had 12 hours and 31 minutes of off-duty time. Their assigned train was made up of four leading locomotives, one distributed power unit (DPU) at the rear of train, 31 loads, 69 empties, and 5,635 tons for 6,418 feet in length and was scheduled to travel between Colton and Bakersfield, CA.

After reporting for duty, the engineer and conductor reviewed their track warrants, train consist, updated notices and held a job briefing to discuss their movement. They then departed the yard office in a van and boarded their assigned train staged at UP's Colton Yard.

After completing a class 1 air brake test, they departed Colton Yard on signal indication at approximately 8:30 p.m. on the UP Alhambra and the Mojave Subdivisions for the duration of their trip until the accident occurred. There were no unusual occurrences and no work en route.

The engineer was seated at the controls on the east side of the leading locomotive and the conductor on the west side. Train #2 was stopped at Walong, CP SP351, milepost 352.5, at a restricting signal. There was traffic ahead due to a 10 miles per hour slow order.

The Accident

At approximately 2:45 a.m., Train #1 struck the rear end of Train #2 at milepost 352.5 on single main track. According to the statements made by Train #1's crew, they proceeded north towards Walong, CA in dynamic braking and sounded the horn at a grade crossing approximately 300 feet prior to Walong. As the train rounded a curve, the crew saw the rear headlight of the DPU locomotive of standing UP Train #2 ahead. The locomotive engineer placed the train into emergency, but was unable to avoid the collision. FRA's review of the event recorder download from the BNSF locomotive indicates that the impact speed was recorded at 19 mph. As a result of the collision, three locomotives and 11 loaded auto railcars derailed on Train #1 and one DPU locomotive and four empty cars derailed on Train #2. Maximum speed on this part of the railroad is 23 miles per hour.

Post-Accident Investigation

The events prior to the collision indicate the UP Train #2 was stopped on single main track with the rear of the train at milepost 352.5. The BNSF Train #1 was stopped at North Marcel milepost 353.0. After receiving a flashing red signal, the BNSF train proceeded north, traversing three 8- to 10-degree curves on a 2.2 per cent descending grade for 0.5 mile before impact. The signal aspect was verified by FRA signal inspectors at the scene indicating the BNSF train should have been operating at restricted speed when the collision occurred.

FRA's investigation into the accident included interviews of the crew members operating BNSF Train #1. The results were substantiated by a review of event recorder data and dispatcher logs. The investigators also secured and analyzed signal and train control records, track inspection records and equipment maintenance inspection records, as well as crew training, testing and certification. Because hazardous materials were carried in six cars in UP's Train #2 consist, but were not among the derailed cars, a review of documentation, hazard communication, train placement and tank car securement was also performed to ensure the safe transportation of the commodities.

As the investigation progressed, the actions of the BNSF train crew were examined. FRA investigators interviewed the train crew on the striking BNSF train and determined the engineer failed to operate at restricted speed. There was an apparent miscommunication in the cab of the locomotive on Train #1 in regards to the flashing red signal they passed at North Marcel. The conductor stated he called out the flashing red signal at North Marcel, CA to the engineer, which indicated they may proceed at restricted speed, and also marked it in his signal awareness form. The engineer stated that it was a flashing yellow signal, meaning they may proceed at a speed other than restricted speed, and conveyed the signal aspect to the conductor.

The evidence supported the conductor's statement. His signal awareness form indicated a flashing red signal at North Marcel. A review of dispatcher logs confirmed the account and were also verified by FRA investigators. After passing the flashing red signal, the engineer was required to travel at "a speed which would require him to stop his train within half the range" of his vision short of a stop signal, engine, or car.

Signal & Train Control

FRA tested signal locations beginning at adjoining control points. The download data from CP Marcel indicated BNSF Train #1 had stopped at North Marcel and then proceeded after receiving a flashing red signal.

FRA conducted post-accident tests and a reenactment. An examination of test records, documents, and downloaded signal and CTC log events found the signal system functioned as intended before the collision.

Mechanical

FRA investigators reviewed the locomotive event recorder downloads which indicated BNSF Train #1 was operating at a speed of 19 miles per hour at the time of impact. FRA reviewed locomotive air slips, daily inspection cards, initial air brake tests and previous mechanical inspection records on all locomotives involved in this accident and noted they were in compliance with no defects noted.

The following cars derailed:

BNSF Train #1

ETTX 850771 (loaded auto carrier)
TTGX 975651 (loaded auto carrier)
TTGX 982121 (loaded auto carrier)
TTGX 988230 (loaded auto carrier)
TTGX 980688 (loaded auto carrier)
SOO 516006 (loaded auto carrier)
ETTX 810436 (loaded auto carrier)
WRWK 300210 (loaded auto carrier)
CSXT 600075 (loaded auto carrier)
TTXG 994504 (loaded auto carrier)

UP Train #2

HLSC 3005 (empty)
HLSC 3043 (empty)
SP 228589 (empty)
TBOX 661119 (empty)
UP5477 (locomotive)

Track

UP Mojave Subdivision at this location is constructed with concrete cross-ties with McKay style fasteners. The grade between the flashing red signal and impact location is 2.2 per cent.

FRA reviewed track inspection records for the UP Mojave Subdivision derailment location with no exceptions noted. The last inspection of this track was conducted on Sunday, May 19, 2013 by a UP track supervisor. No FRA defective conditions were noted during this inspection. Track measurements were taken ahead of and after the point of derailment with no exceptions taken.

After passing the flashing red signal, the BNSF train traversed three curves before impact. Curve number 85 is a compound curve that starts at an 8-degree and increases to a 10-degree curve. The next two curves, numbers 84 and 85, are both 10-degree curves. Curve 85 is where the impact occurred. This track is listed in the timetable as FRA Class 2 with a maximum speed of 23 miles per hour for freight trains.

All track measurements were within FRA Track Safety Standards

Hazardous Materials

FRA verified the consist information on both the BNSF and UP trains involved, made inspections and determined there were no hazardous materials cars derailed or compromised because of this impact collision.

FRA verified all loading and packaging requirements. In addition, all shipping documents in the possession of the railroad were found to be in compliance with Federal regulations. The train crews had the hazardous material information in their possession in compliance with Federal requirements.

Analysis and Conclusions

Analysis - Operations

A review of all available records of tests, inspections and certifications of the crews of BNSF Train #1 and UP Train #2 showed each was in compliance with Federal regulations. The records included operating rules training and testing, efficiency testing, hours of service, engineer certification, rules examinations and other training records.

BNSF held a formal investigation into the actions of its conductor and engineer involved in the accident, which resulted in their dismissal for violations of BNSF's GCOR Rules and air brake and train handling (ABTH) rules.

Conclusions - Operating

FRA's review of all the data received indicated both train crews were in compliance with applicable Federal regulations. BNSF's train crew was in violation of GCOR and ABTH rules. Based on interviews of BNSF Train #1's crew, there was a miscommunication between the conductor and the engineer with the aspect of the red signal they passed at North Marcel. The engineer believed he was operating under the conditions of a yellow aspect and not the red aspect the conductor communicated to him. A review of train make-up from each train was excluded as having contributed to the accident.

Disciplinary Action and Rules Violations

BNSF Train #1's conductor and engineer were dismissed from their employment for violating BNSF's GCOR Rule 1.6, "unsafe conditions and carelessness will not be condoned;" Rule 6.27, "movement at restricted speed;" Rule 9.2.13 "proceed at restricted speed;" and ABTH Rule 103.71 "operating on a grade".

Analysis - Signal

FRA testing and review of records indicated that the signal system was in compliance with Federal regulations and functioned as intended at the time of the derailment.

Conclusion - Signal

Signal and train control are excluded as having contributed to the accident.

Analysis - Mechanical

FRA's inspection of the subject cars and locomotives revealed each was in compliance with Federal regulations. A comprehensive review of each car's repair and alert history showed no indication of previous problems that could have contributed to this derailment.

Conclusion - Mechanical

The overall mechanical condition of the locomotives and cars involved in the collision and subsequent derailment excluded both as having contributed to this accident.

Analysis - Track

FRA and UP tested this track with geometry cars and the measurements were within tolerances.

Conclusion – Track

Condition of the track at the time of the derailment excludes it as having contributed to the accident.

Analysis - Fatigue

FRA uses an overall effective rate of 77.5 percent as the baseline for fatigue analysis, which is equivalent to blood alcohol content (BAC) of 0.05. At or above this baseline, we do not consider fatigue as probable for any employee.

FRA obtained fatigue related information, including a 10-day work history, for the crew members assigned to Train #1 the BNSF train.

(E1) Locomotive engineer assigned to Train #1

Sleep Settings excellent
Overall effectiveness 68.97%
Lapse index 5.3
Reaction Time 144
Chronic Sleep Debt 8.2
Hours of Continuous Wakefulness 20.77
Time of Day 02:45
BAC Equivalent >0.08
Conclusion: Fatigue was probable for this employee

(C1) Conductor assigned to Train #1

Sleep Settings excellent
Overall effectiveness 64.31%
Lapse Setting 6.4
Reaction Time 153
Chronic Sleep Debt 9.05
Hours of Continuous Wakefulness 14.77
Time of Day 02:45
BAC Equivalent >0.08
Conclusion: Fatigue was probable for this employee

Conclusion – Fatigue

Upon analysis of fatigue related information, FRA concluded that fatigue was probable for one or more of the employees. This suggests the employee or employees may have been working at a diminished level of safety (effectiveness) due to mental and/or physical attributes associated with fatigue, which may have contributed to the cause of the accident.

Analysis – Toxicology Testing

Post- accident toxicology testing was conducted on the engineer and conductor operating BNSF Train #1. Results of these tests were negative.

Conclusion - Toxicology Testing

Impairment due to alcohol or drugs was excluded as contributing to the accident.

Overall Conclusions

Based on an analysis of records of tests and inspections of mechanical equipment, track, and signal and train control systems and devices, each were excluded as having contributed to the accident. An analysis of work and rest cycles for the 10 days prior to the accident suggests fatigue was probable for the crew of Train #1 and likely contributed to the accident.

Probable Cause and Contributing Factors

FRA concluded the probable cause of the accident was failing to comply with an automatic block or interlocking signal displaying a stop indication. A contributing factor was failing to comply with a restricted speed in connection with the restrictive indication of a block or interlocking signal. FRA also concluded fatigue was a probable contributing factor in this accident.