



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

***Accident Investigation Report
HQ-2013-13***

***Union Pacific (UP)
Chafee, MO
May 25, 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 Union Pacific Railroad Company	1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. 0513SL011
2. Name of Railroad Operating Train #2 BNSF Railway Company	2a. Alphabetic Code BNSF	2b. Railroad Accident/Incident No. SF0513118

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. 0513SL011	
2. U.S. DOT Grade Crossing Identification Number		3. Date of Accident/Incident 5/25/2013	4. Time of Accident/Incident 2:35 AM	
5. Type of Accident/Incident Side Collision				
6. Cars Carrying HAZMAT	7. HAZMAT Cars Damaged/Derailed	8. Cars Releasing HAZMAT	9. People Evacuated	10. Subdivision Chester
11. Nearest City/Town Chafee		12. Milepost (to nearest tenth) 131.1	13. State Abbr. MO	14. County SCOTT
15. Temperature (F) 50 °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-80, Passenger Trains-90		21. Annual Track Density (gross tons in millions) 108
				22. Time Table Direction South

OPERATING TRAIN #1

1. Type of Equipment Consist: Freight Train		2. Was Equipment Attended? Yes		3. Train Number/Symbol 2ASMAR25							
4. Speed (recorded speed, if available) R - Recorded E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 4782		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						
47 MPH					Code 0						
6. Type of Territory Signalization: <u>Signaled</u> Method of Operation/Authority for Movement: <u>Signal Indication</u> Supplemental/Adjunct Codes: <u>G, N/A</u>											
7. Principal Car/Unit (1) First Involved <i>(derailed, struck, etc.)</i>		a. Initial and Number UP5668	b. Position in Train 1	c. Loaded (yes/no)	8. If railroad employee(s) tested for drug/ alcohol use, enter the number that were positive in the appropriate box.						
(2) Causing <i>(if mechanical, cause reported)</i>		0	0		Alcohol 0						
					Drugs 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		2	0	0	0	0	(1) Total in Equipment Consist 60	0	0	0	0
(2) Total Derailed		2	0	0	0	0	(2) Total Derailed 14	0	0	0	0
12. Equipment Damage This Consist 4259014			13. Track, Signal, Way & Structure Damage 3832368								
14. Primary Cause Code H221 - Automatic block or interlocking signal displaying 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: 4 Mins: 45		Hrs: 4 Mins: 45	
Casualties to:		22. Railroad Employees		23. Train Passengers		24. Others		25. EOT Device?		26. Was EOT Device Properly Armed?	
Fatal		0		0		0		Yes		Yes	
Nonfatal		2		0		5		27. Caboose Occupied by Crew?		No	
28. Latitude 37.000000000				29. Longitude -90.000000000							

OPERATING TRAIN #2

1. Type of Equipment Consist: Freight Train					2. Was Equipment Attended? Yes		3. Train Number/Symbol UKCKHKM005					
4. Speed (recorded speed, if available) R - Recorded E - Estimated		Code R	5. Trailing Tons (gross exluding power units) 8848		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> G, 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>		DJJX301119		15		yes					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		e. Caboose	
		b. Manual	c. Remote	d. Manual	e. Remote		a. Freight	b. Pass.	c. Freight	d. Pass.		
(1) Total in Train	3	0	0	0	0	(1) Total in Equipment Consist	75	0	0	0	0	
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	13	0	0	0	0	
12. Equipment Damage This Consist 254566				13. Track, Signal, Way & Structure Damage 389000								
14. Primary Cause Code H221 - Automatic block or interlocking signal displaying 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: 7 Mins: 35		Hrs: 7 Mins: 35		
Casualties to:		22. Railroad Employees		23. Train Passengers		24. Others		25. EOT Device?		26. Was EOT Device Properly Armed?		
Fatal		0		0		0		Yes		Yes		
Nonfatal		0		0		5		27. Caboose Occupied by Crew?		No		
28. Latitude 37.000000000				29. Longitude -90.000000000								

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	
12. Location of Warning N/A		11. Roadway Conditions 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		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 May 25 2013 at 2:35 a.m. Central Daylight Time (CDT), a southbound Union Pacific Railroad Company (UP) train, with train symbol 2ASMAR25 (Train 1) proceeding compass direction west at 47 mph with two lead locomotives and 60 loaded cars, struck the east side of a southbound, compass direction south BNSF Railway Company (BNSF) train with train symbol UKCKHKM005 (Train2). Train 2 consisted of three lead locomotives and 75 loaded gondolas of scrap metal. The side collision occurred at Rockview Interlocking, a railroad crossing at grade, where a single main track of the UP crosses a single main track of the BNSF. This interlocking is located near Chaffee, Missouri (eight miles south of Cape Girardeau, Missouri) The resultant derailment caused the collapse of a two-lane concrete highway bridge located directly above the Rockview Interlocking crossing diamond. Two automobiles en route to Chaffee were operated onto the collapsed bridge resulting in five non-life threatening injuries. The Train 1 engineer and conductor also suffered non-life threatening injuries. All seven injured people were treated and released. There was no hazardous material involved.

Train 2 proceeded by a clear signal indication, approaching and occupying the limits of Rockview Interlocking and was operating through the interlocking at 23 mph at the time of the accident. Train 1 proceeded by a series of signals including a "clear", "advanced approach", "approach", and "restricting/signals. The train then proceeded into the crossing past a signal displaying a "stop" indication. As Train 1 proceeded by the "restricting" signal, located about 1,300 feet prior to impact, the conductor initiated an emergency brake application. Train 1 impacted the 12th car from the head of Train 2, which shoved the car and 4 trailing cars westward and shearing the bridge support piers located on the north side of the crossing diamond. This caused the collapse of the two-lane, concrete bridge on state Route M, causing the bridge to break into two pieces and fall, crushing the railcars following the lead locomotives of Train 1 and also the railcars from Train 2 cars which were in the vicinity. The Train 1 lead locomotive came to rest on its left side mostly intact immediately west of the fallen bridge. The 2nd locomotive was adjacent to the first, leaning to its left side, and it caught fire.

The FRA investigation determined the cause of the accident was "H221-automatic block or interlocking signal displaying a stop indication-failure to comply." A contributing cause was "H605 -failure to comply with restricting speed in connection with the restrictive indication of a block or interlocking signal conveying a restrictive indication." A second contributing cause was identified as "H199 - employee physical condition, other." This was based on findings of the FRA's fatigue analysis which indicated fatigue was probable for both crew members of Train 1 and they may have been working at a diminished level of safety (effectiveness) due to mental and/or physical attributes associated with fatigue. This may have contributed to the cause of the accident/incident.

This is not an Amtrak route. It was dark at the time of the accident and the weather was clear with a temperature of 50 °F. Total damages from this incident exceeded 10 million dollars.

NARRATIVE

Circumstances Prior to the Accident:

The crew of Train 2 consisted of a BNSF engineer and conductor. After receiving a 2-hour call they reported for duty at the Lindenwood Yard Office in St. Louis, Missouri at 7 p.m. on May 24, 2013. This is the away-from-home terminal for both crew members. Both crew members received more than the statutory off-duty period prior to reporting for duty. After receiving instructions and conducting a job briefing, they attached the three lead locomotives to their train consisting of 75 gondolas of scrap metal. Train 2 was scheduled to travel from St. Louis, Missouri to Blytheville, Arkansas. They were in schedule to operate on the BNSF River Subdivision from milepost (MP) 0 at SE Junction to their home terminal in Chaffee, at MP 143.1. They departed Lindenwood Yard at 8:32 p.m. The forward-facing video track image recorders (TIR) was operational on the lead and trailing locomotives.

They operated through several slow orders from MP 0, SE Junction, and stopped at MP 78, North McBride Control Point, because of a stop signal indication. The dispatcher authorized them to proceed into the block to South McBride Control Point, where they proceeded by a clear (proceed) indication. They operated to Rockview Interlocking at milepost 141 under clear (proceed) signal indications. The engineer was seated on the right side and the conductor was seated on the left side of the lead locomotive. They were slowing their train to enter yard limits at Chaffee and were proceeding at 23 mph through the interlocking limits. Train 2 entered the Rockview Interlocking limits extending across the UP main track a little less than 1 minute before the arrival of Train 1. The BNSF timetable direction of the train was south. The geographical direction was south.

The BNSF method of operation in this area is by signal indications of a traffic control system (TCS) on single main track. The maximum authorized speed in this area is 60 mph. The maximum authorized speed through the Rockview Interlocking is 25 mph.

The BNSF single main track consists of 132lb RE continuous welded rail (CWR) approaching and extending through the Rockview Interlocking. The grade is river grade and tangent in this area.

Train 1 - The crew of Train 1 consisted of a Union Pacific engineer and conductor. After receiving a 2-hour call they reported for duty at Salem, IL at 9:45 p.m. on May 24, 2013. This is the home terminal for both crew members. This is a regular job that works between Salem, IL and Dexter, MO. Salem is located at MP 253.8 on the Mt. Vernon Subdivision. Both crew members received more than the statutory off-duty period prior to reporting for duty. They boarded the lead locomotive and departed after a job briefing at 10:10 p.m. Forward-facing video track image recorders (TIR) were operational on both lead locomotives. The engineer called the dispatcher on the radio and told him they were headed south. The conductor's speed recorder was not functioning on his console, but the engineer's speed recorder was working properly. They proceeded to Mt. Vernon Junction at MP 274.1, where they met a northbound train. They continued south as soon as it cleared. The engineer stated he was calling signals and 16 train's speed to the conductor for his signal awareness log until they arrived at MP 339.1 on the Mt. Vernon Subdivision and entered the Chester Subdivision at Gorham Junction, (MP 84.8). He was unable to recall anything about the trip after leaving Gorham, Junction ? located about 47 miles prior to the accident site at MP 131.1. The conductor stated that the engineer appeared to be awake, looked normal, and was sounding the train horn for highway grade crossings.

When Train 1 arrived at Ancell Control Point (MP 125.9) a clear (green) signal was displayed, which authorized them to proceed. The train continued en route operating at 50 mph. When the train arrived at MP 127.7, an advance approach (flashing yellow) signal was displayed, which indicates that the crew was to proceed prepared to stop at the second signal and to immediately reduce speed to 40 mph. Train 1 then passed North Quarry CP 129D which was displaying an approach (yellow over red) signal indicating the crew was to slow to 30 mph and to be prepared to stop before passing the next signal. The train continued to proceed at 50 mph.

When Train 1 arrived at Rockview Interlocking (MP 131.1) the first signal was displaying a restricting (flashing red) signal which indicates that the train is to proceed at restricted speed. The train was still operating at 50 mph as Train 1 arrived at the restricting signal. The conductor realized they were getting by a restricting signal indication and made an emergency application of the air brakes from his console. After he applied the train air brakes, the engineer began sounding the train horn approximately 1,300 feet prior to arriving at the Rockview Interlocking Home Signal, which was displaying a stop (red) indication at MP 131.2.

The UP method of operation in this area, is by signal indications of a TCS on single main track. The maximum authorized speed is 70 mph. There is a 40 mph permanent speed restriction through the Rockview Interlocking limits.

The UP main track is 136lb RE CWR. Southbound from Ancell Control Point (CP) 126 en route to Rockview Interlocking the track is tangent with curves at MP 126.3 – 126.5 (1 degree 58 minutes), MP 127.2 – 127.8 (1 degree 0 minutes) and MP 129.8 2 – 130.1 (2 degree 19 minutes). From MP 130.2 to Rockview Interlocking at MP 131.4 the track is tangent. Track grade is mostly level from Ancell to Rockview with grades up or down of .45%.

Accident:

Train 1 entered the Rockview Interlocking limits at 47 mph with the train's emergency air brakes applied and the train horn sounding. Train 1 struck Train 2 at the 12th car from the head-end and shoved the 12th car and 3 trailing cars through the support piers of the bridge at Highway M. The bridge broke into 2 pieces and fell onto the train cars below. Shortly after the collapse, a 2010 Nissan Versa automobile driven by a 31 year-old male with a 38 year-old female passenger, proceeded from the north side and down to the center of the collapsed concrete sections. Another automobile, a 2000 Chevy Malibu driven by a 22 year-old male, a 20 year old female passenger seating in the front seat, and a 20 year-old female passenger sleeping in the back seat, followed the first vehicle onto the collapsed bridge.

As a result of the collision, 13 cars of Train 2 were derailed. The two lead locomotives and 14 cars of Train 1 were derailed. Spilled diesel fuel from the trailing derailed UP locomotive caught fire. The preliminary damage was estimated to be in excess of \$10 Million. Rockview is an unincorporated neighborhood located next to the tracks and 911 calls went out immediately. Emergency responders promptly arrived, assisted the UP conductor in removing the UP engineer from the lead locomotive, helped the five motorists into ambulances, and started fighting the fire on the UP 2nd locomotive. The two UP trainmen and five motorists were transported to St. Francis Hospital in Cape Girardeau. The Train 1 engineer and conductor were bruised and complaining of pain. The conductor was also bleeding from his forehead. The five motorists were also bruised and in pain. One female passenger suffered a broken ankle.

It was clear and 50° F at the time of the accident.

Analysis and Conclusions:

Analysis: Toxicological Testing: The engineers and conductors of both crews involved underwent testing of blood, breath, and urine.

Conclusion: Federal Railroad Administration Post-Accident Forensic Toxicology Result Reports indicate that the four employees tested had negative test results for alcohol and controlled substances.

Analysis: Crew Fatigue: FRA obtained fatigue related information from the train crew. Information gathered included a 10-day work history for the UP and BNSF crew members involved in the derailment.

Conclusion: FRA concluded that fatigue was probable for one or more crew members of Train 2 and the employee(s) may have been working at a diminished level of safety (effectiveness) due to mental and/or physical attributes associated with fatigue. FRA also concluded that fatigue was probable for one or more crew members of Train 1, and the employee(s) may have been working at a diminished level of safety (effectiveness) due to mental and/or physical attributes associated with fatigue. The Office of Railroad Safety's Human Performance Program Manager concurs with these findings and agrees possible fatigue of the crew of Train 1 may have contributed to the cause of the accident/incident.

Analysis: Train 2 BNSF Locomotive Engineer and Conductor's Operating Performance:

The BNSF crews were governed by the General Code of Operating Rules (GCOR), effective April 7, 2010 and updated as of February 1, 2013. The territory is designated as the BNSF Springfield Division, River Subdivision. At the time of the accident, the current timetable was Springfield Division Timetable No. 8 (August 15, 2012).

The applicable supplements to the operating rules were:

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System Special Instructions – Dated 7/18/12 with revisions through 5/1/13

Air Brake and Train Handling Rules – Dated 4/7/10 with revisions through 5/1/13

TY & E Safety Rules – Dated 10/30/05 with revisions through 11/1/12

Conclusion: Train 2 crew was in compliance with all applicable BNSF railroad operating rules.

Analysis: Train 1 UP Locomotive Engineer and Conductor's Operating Performance:

The UP crews were governed by the GCOR, effective April 7, 2010 and updated as of April 23, 2013. The territory was designated as UP Northern Region, St. Louis Service Unit, Chester Subdivision. At the time of the accident, the current timetable was St. Louis Timetable No. 4, effective December 14, 2009.

The applicable supplements to the operating rules were:

System Special Instructions – Dated 4/20/12

Air Brake and Train Handling Rules – Dated 4/20/12

Safety Rules – Dated 7/30/07 with revisions through 4/23/13

System General Orders - Dated 4/23/13

Conclusion: The crew of Train 1 was not in compliance with all applicable railroad operating rules, including:

9.2.4: Advance Approach - Proceed prepared to stop at second signal. Freight trains exceeding 40 mph must immediately reduce to 40 mph.

9.2.6: Approach - Proceed prepared to stop before any part of train or engine passes the next signal. Freight trains exceeding 30 mph must immediately reduce speed to 30mph.

9.2.13: Restricting - Proceed at restricted speed, not exceeding the prescribed speed through the turnout when applicable.

6.27: Movement at Restricted Speed - When required to move at restricted speed, movement must be made at a speed that allows stopping within half the range of vision short of:

- Train
- Engine
- Railroad car
- Men or equipment fouling the track
- Stop signal, or
- Derail or switch lined improperly

When a train or engine is required to move at restricted speed, the crew must keep a lookout for broken rail and not exceed 20 mph.

Comply with these requirements until the leading wheels reach a point where movement at restricted speed is no longer required.

9.2.15 Stop - Stop before any part of train or engine passes the signal.

Analysis: Signal - A complete inspection of the signal system was accomplished by FRA and is provided with attachments. Also a re-enactment of the Train 1 route from Ancell to Rockview with measured preview to signal indications involved proved that the preview to all signal indications was unobstructed. Review of signal interlocking, highway grade crossing, and review of locomotive TIR footage indicated signal indications provided were proper. Review of the lead UP locomotive event recorder and TIR footage indicated the crew did not comply with the displayed signal indications.

Conclusion: The crew was in noncompliance with the requirements of the signal indications displayed.

Analysis: Track Maintenance History: Track was inspected and inspection history was examined.

Conclusion: There were no known geometry or rail deviations that would have caused or contributed to this accident.

Analysis: Recent derailments in the area of Rockview: On January 29 2013, 15 cars of Train Symbol ZYCMX-29 derailed due to high wind. On April 22 2013, the 3 lead locomotives and 4 railcars of a train derailed at Rockview Interlocking because of wide gage.

Conclusion: Structures, systems, and track conditions did not contribute in any way to the cause of this accident.

Analysis: Mechanical: FRA conducted a crash worthiness evaluation and complete mechanical inspection.

Conclusion: The mechanical condition of Train 1 was in compliance with FRA regulations and did not contribute to the accident. The crash worthiness inspection determined the lead locomotive cab performed as intended and furnished a survivable environment for the crew.

Overall Analysis: FRA performed an exhaustive investigation including interviews of the crews of Train 1 and Train 2, examining the UP and BNSF signal systems, reviewing locomotive event recorders, examining the locomotive forward facing video cameras from both trains, reviewing the highway grade crossing speed recorders, and a complete mechanical inspection of the train equipment. A fatigue analysis was also performed on all crew members involved.

Overall Conclusions: The mechanical functioning of the Train 1 air brakes was correct and the class 1 air brake test had been accomplished at Salem, IL just prior to Train 1 departure. The forward facing locomotive video cameras on Train 1 were black and white, but indicated adequately that the signal indications were properly displayed. UP's defect detector at MP 127.99 recorded UP Train 2ASMAR-22 to be operating at 55 mph at its location. The UP's County Road 209 Highway-Rail Grade Crossing Warning System (HGCS) at MP 131.10 recorded a detected speed of 47 mph for Train 1. The Train 1 lead locomotive event recorder was also in agreement with these recorded speeds. FRA also did a fatigue analysis that indicated both crew members of Train 1 may have been working at a diminished level of safety (effectiveness) due to mental and/or physical attributes associated with fatigue. This may also have contributed to the cause of the accident/incident.

Probable Cause and Contributing Factors:

The FRA's investigation determined the accident occurred because Train 1's engineer and conductor failed to comply with the signal indications as displayed. FRA agrees with UP's stated probable cause of "H221, Automatic block or interlocking signal displaying a stop indication - failure to comply." A contributing cause was "H605, Failure to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal." A second contributing cause was identified as "H199-

to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal.” A second contributing cause was identified as “H199- Employee physical condition, other.” This was based on findings from FRA’s fatigue analysis, which indicated fatigue was probable for both crew members of Train 1 and they may have been working at a diminished level of safety (effectiveness) due to mental and/or physical attributes associated with fatigue. This may also have contributed to the cause of the accident/incident.