



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

***Accident Investigation Report
HQ-2019-1327***

***Union Pacific Railroad Company (UP) Derailment
Oshkosh, Nebraska
March 3, 2019***

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.

SYNOPSIS

On March 3, 2019, at 11:18 p.m., MST, eastbound Union Pacific Railroad Company (UP) coal train 2CBTWL9-03 (Train 1) derailed 35 cars on Main Track 2, at Milepost (MP) 76.45 on the North Platte Service Unit, South Morrill Subdivision, near Oshkosh, Nebraska. Train 1 had two locomotives on the head end, 135 loaded coal cars, and one distributed power locomotive on the rear. It was 7,512 feet long, and had 19,305 trailing tons.

Weather was dark and clear with a temperature of -15°F.

UP reported monetary damages of \$1,729,168 to equipment; and \$225,700 to track and signal systems; totaling \$1,954,868.

No fatalities or injuries were reported because of the derailment. No hazardous materials were on the train and no evacuation was required. No response was required from emergency service first responders.

The FRA's investigation determined the cause of the accident to be E66C -- Damaged flange or tread (flat).

FRA also determined T299 – Other rail defects; M199 -- Other extreme environmental conditions (extreme cold); and H999 – Other train operation/human factors (failure to identify and address high KIP wheel) were contributing causes to the accident.

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 Union Pacific Railroad Company	1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. 0319GP002
--	---------------------------	---

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. 0319GP002	
2. U.S. DOT Grade Crossing Identification Number		3. Date of Accident/Incident 3/3/2019	4. Time of Accident/Incident 11:18 PM	
5. Type of Accident/Incident Derailment				
6. Cars Carrying HAZMAT 0	7. HAZMAT Cars Damaged/Derailed 0	8. Cars Releasing HAZMAT 0	9. People Evacuated 0	
10. Subdivision UNION PACIFIC RAILROAD COMPANY - SOUTH MORRILL				
11. Nearest City/Town Oshkosh		12. Milepost (to nearest tenth) 76.45	13. State Abbr. NE	14. County GARDEN
15. Temperature (F) -14 °F	16. Visibility Dark	17. Weather Clear		18. Type of Track Main
19. Track Name/Number Main Track 2		20. FRA Track Class Freight Trains-40, Passenger Trains-60		21. Annual Track Density (gross tons in millions) 136.3
		22. Time Table Direction East		
23. PTC Preventable No		24. Primary Cause Code [E66C] Damaged flange or tread (flat)		25. Contributing Cause Code(s) T299, M199, H999

OPERATING TRAIN #1

1. Type of Equipment Consist: Freight Train					2. Was Equipment Attended? Yes			3. Train Number/Symbol 2CBTWL9-03				
4. Speed (recorded speed, if available) R - Recorded 40.0 MPH E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 19305		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, J</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 (derailed, struck, etc.)		UCEX 96076	57	yes				0	0			
(2) Causing (if mechanical, cause reported)		UCEX 2373	35	yes	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	2	0	0		0	1	(1) Total in Equipment Consist	135		0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	35	0	0	0	0	
12. Equipment Damage This Consist 1729168			13. Track, Signal, Way & Structure Damage 225700									
Number of Crew Members						Length of Time on Duty						
14. Engineers/Operators 1		15. Firemen 0		16. Conductors 1		17. Brakemen 0		18. Engineer/Operator Hrs: 3 Mins: 33		19. Conductor Hrs: 3 Mins: 33		
Casualties to:		20. Railroad Employees		21. Train Passengers		22. Others		23. EOT Device? Yes		24. Was EOT Device Properly Armed? Yes		
Fatal		0		0		0		25. Caboose Occupied by Crew?		N/A		
Nonfatal		0		0		0						
26. Latitude 41.440028000				27. Longitude -102.445295000								

SKETCHES

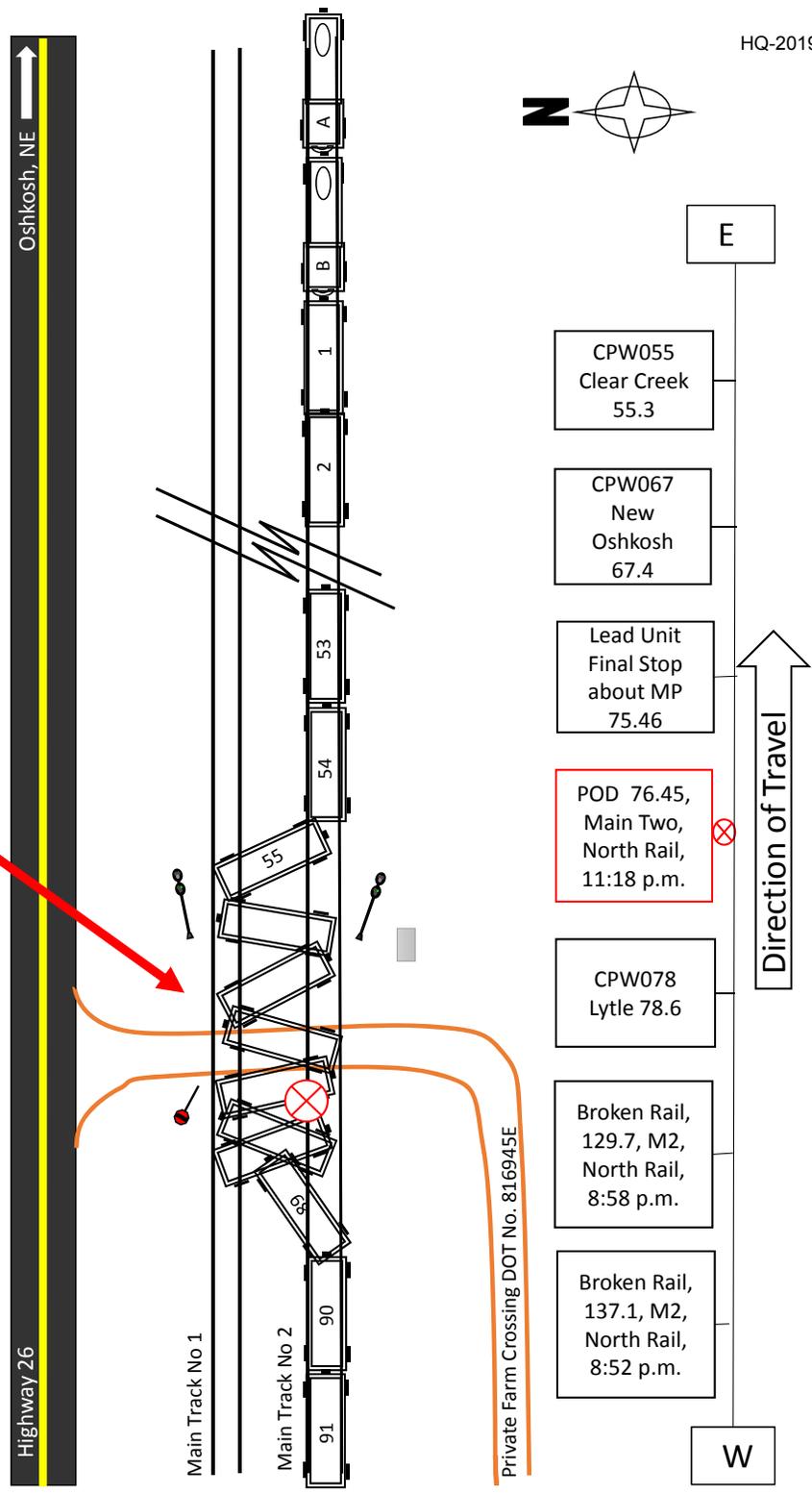
Sketch - S1

HQ-2019-1327

HQ-2019-1327
Oshkosh, NE
03/03/2019
11:18 p.m. MST

Note: All trailing wheels from UCEX 2373, north side (35th from Head), after direction of travel showed marks consistent with a broken rail.

Note: 35 Cars derailed in accordion fashion



CPW055
Clear Creek
55.3

CPW067
New
Oshkosh
67.4

Lead Unit
Final Stop
about MP
75.46

POD 76.45,
Main Two,
North Rail,
11:18 p.m.

CPW078
Lytle 78.6

Broken Rail,
129.7, M2,
North Rail,
8:58 p.m.

Broken Rail,
137.1, M2,
North Rail,
8:52 p.m.

Train Consist	
A – UP 6758	54 From Head UCEX 2212
B – UP 6423	55 From Head UCEX 96076
1 From Head UCEX 22503	89 From Head UCEX 26128
2 From Head UCEX 22405	90 From Head UCEX 97242
53 From Head UCEX 96028	91 From Head UCEX 94116

* Not to scale

NARRATIVE**Circumstances Prior to the Accident**

Union Pacific Railroad Company (UP) eastbound freight train 2CBTWL9-03 (Train 1) was a unit cycling coal train with two head end locomotives and one distributed power (DP) locomotive at the rear of the train. The train consisted of 135 loads, 0 empties, 19,305 tons, and was 7,512 feet in length. What defines a unit cycling train (cycle train) is its continuous movement from the origin loading facility, moving loads to the customer unloading facility, and moving empties back to the origin loading facility where it continues the cycle until the customer's order is met. The last Class I air brake inspection was performed at South Morrill, Nebraska, on March 3, 2019 at 6:16 p.m., MST.

The assigned train crew consisted of an engineer and a conductor. The crew went on duty at 7:45 p.m. on March 3, 2019, in Morrill, Nebraska. This was the engineer's and conductor's away terminal. Both crewmembers had received more than the statutory off-duty rest prior to reporting for duty. Their assignment was to transport their loaded coal train from Morrill to North Platte, Nebraska. The train crew conducted no pick-ups or set-outs during the trip.

Train 1 was operating on the North Platte Service Unit, South Morrill Subdivision, near Oshkosh, Nebraska. The method of operation through this area is by a Traffic Control System (TCS) supplemented by a Positive Train Control (PTC) overlay. PTC was cut-in and operational with a maximum authorized timetable speed of 40 mph. This area has two main tracks with Main Track No. 1 (Main 1) being the geographic north track.

Train 1 was maintaining a general speed of 40 mph on Main Track No. 2 (Main 2). At approximately Milepost (MP) 77.0 the track is tangent with a 0.35-percent descending grade. The track remains tangent; however, the grade flattens out to a .03-percent descending grade at MP 76.45. Present in the immediate vicinity of MP 76.46, there is a private grade crossing, intermediate signal and signal bungalow (MP 76.4) and a dragging equipment detector at MP 76.3.

Weather was dark and clear with a temperature of -15°F.

The Accident

At 11:18 p.m. and approaching MP 76.45 the train experienced an Undesired Emergency (UDE) brake application. Immediately following the UDE, the engineer contacted the UP dispatcher to notify them that the train experienced an UDE brake application and the conductor was walking the train. Upon return of the conductor, the crew notified the dispatcher that they had derailed approximately 35 cars and they were fouling Main 1.

Train 1 derailed lines 55 through 89 from the head end in an accordion-fashion and caused extensive damage to both Main 1 and Main 2.

UP reported monetary damages of \$1,729,168 to equipment; and \$225,700 to track and signal systems; totaling \$1,954,868.

No fatalities or injuries were reported because of the derailment. No hazardous materials were on the train and no evacuation was required. No response was required from emergency service first responders.

Post-Accident Investigation

On March 4, 2019, FRA began an investigation of this accident. After the on-site inspection and investigation, FRA investigators requested all necessary event recorder downloads, dispatcher audio files, records, forms, and other documentation necessary to conduct the final analysis and conclusion concerning the facts of the accident.

The following analysis and conclusions represent the findings of the FRA investigation.

Analysis and Conclusions

Analysis - Toxicology Testing: The engineer and conductor involved in this derailment were tested under FRA's mandatory post-accident toxicological test requirements because the derailment exceeded the \$1.5 million threshold. All test results were negative.

Conclusion: FRA determined that neither drugs nor alcohol contributed to the cause or severity of the accident.

Analysis - Fatigue: A fatigue analysis was made regarding the performance level of the UP crew after their assigned train experienced a derailment. The UP crew of Train 1 included two crew members: a locomotive engineer and a conductor. FRA obtained a 10-day work history for the engineer and conductor involved in this accident.

FRA uses an overall effectiveness rate of 72 percent as the baseline for fatigue analysis; this is the level at which the risk of human factor accidents is equal to chance. Schedules at or below this baseline for 80 percent or more of the time are not considered to have an excessive risk for fatigue as a contributing factor for an employee involved in an accident or incident.

The analysis determined that while fatigue was experienced by the engineer, the biomathematical analysis of schedules determined that these schedules did not violate the established fatigue threshold for 20 percent or more of the time: the standard for determining if the risk of fatigue contributing to the accident was greater than chance. While fatigue was present with the engineer, fatigue is unlikely to have contributed to the accident as the handling and operations of the train did not contribute to the derailment. The conductor's schedules did not reveal any excessive fatigue risk.

Conclusion: FRA determined fatigue did not contribute to the cause or severity of this accident.

Analysis - Locomotive Engineer Operating Performance: The lead locomotive was equipped with a speed indicator and event recorder as required. The recorder data was downloaded and analyzed by the UP and FRA investigating teams. The locomotive engineer was found to have complied with all applicable UP operating rules and train-handling requirements.

Conclusion: FRA determined that the locomotive engineer operating performance did not contribute to the cause or severity of the derailment.

Analysis - Train Mechanical Information: Train 1 received an extended haul Class 1 train inspection at South Morrill, Nebraska, on March 3, 2019; no defects were noted. The head end, or east portion of the train that had not derailed was repositioned from the derailment site to the UP yard at North Platte for inspection. This portion consisted of the two lead locomotives and 54 cars. FRA performed a walking inspection of the train at North Platte, after the UP carmen performed their inspection.

FRA noted no defects for the locomotives or the first 52 cars inspected. Car No. UCEX 2373 was in position No. 35 from the head end. After the derailment, this car was placed in bad order status by UP at North Platte due to the L2 brake shoe missing. FRA inspected the L2 wheel and found at least one shelled spot greater than 2 ½ inches. This is considered a condemnable flat spot per Title 49 Code of Federal Regulations (CFR) Section § 215.103(f)(1), Wheel Defects. The trailing 19 cars behind Car No. UCEX 2373 were found to have witness marks on the north side wheels (same side as L2 on Car No. UCEX 2373) in the direction of travel consistent with hitting a broken rail.

Prior to the derailment, on February 26, 2019, at 2:44 p.m., a UP mechanical alert for Car No. UCEX 2373 had been generated for the L2 wheel having 126.49 KIPS (unloaded). (A KIP is a U.S. customary unit of force. It equals 1,000 pounds-force, used primarily by American architects and engineers to measure engineering loads). The UP system generated a set-out message on February 26, 2019, and listed several possible set-out locations. On March 2, 2019, at 12:05 a.m., and again on March 3, 2019, at 4:37 p.m., a UP mechanical alert was generated for L2 roller bearing on Car No. UCEX 2373 showing a history of high temperature readings. These temperature readings were not high enough to trigger the defect detectors audible warning system to alert the train crew.

After the derailment, on March 4, 2019, at 8:45 a.m., a UP mechanical alert for Car No. UCEX 2373 was generated for the L2 wheel having 181.57 KIPS (loaded). This last alert was after the derailment while the car was moving into North Platte prior to FRA inspection.

UP is a member of the Association of American Railroads (AAR). The 2018 AAR Field Manual of Interchange Rules lists rules for the proper inspection and maintenance of freight cars in North America. The AAR, through its interchange requirements, sets limits for wheel impact loads. Based on Wheel Impact Load Detector (WILD) information, these thresholds are set for advice, alerts, condemnation, and

immediate action. These nationwide WILDs measure wheel impact in KIPS.

AAR Rule 41 specifically addresses how member railroads should inspect and address high-impact wheels. Rule 41, bullet 17 reads: "When a wheel is detected by a wheel impact load detector reading 65 KIPS or greater for a single wheel, it will be identified in the Equipment Health Management System (EHMS). This will be considered a Window of Opportunity for the responsible party."

UP System Special Instructions (SSI) Rule 13.6 states: "For either Level 1 or Level 2 impacts, stop train and inspect car or locomotive for damaged wheels."

Per UP, the definition for these levels are:

Level 1 is a freight car with a KIP reading between 140 and 160.

Level 2 is a locomotive with a KIP reading between 110 and 130.

The UP system utilized for identifying high-impact wheels recorded by wayside detectors is designed so that readings below 140 KIPS are not communicated to field personnel unless the train is "yarded," meaning it reached a terminating location. Trains not "yarded" such as cycle trains operating as "run-through trains" to final destination do not generate notification of alerts to field personnel. FRA expressed these concerns and UP was not willing to change this process. FRA does not regulate this issue and it is left to railroad preference. Train 1 was a cycle train operating between Black Thunder Coal Mine, Wyoming, and West Labadie Power Plant, Missouri, and was not yarded at any time between the initial mechanical alert on February 26, 2019, and the derailment on March 3, 2019. UP records do not indicate Car No. UCEX 2373 was set out, repaired, or inspected for wheel defects prior to the derailment.

FRA investigators researched previous published data to support our conclusion the high-impact wheel created the broken rail which caused the 35-car Oshkosh derailment.

FRA determined that had field personnel been notified of the wayside detector alerts at the threshold 90 KIPS and above (which is a condemnable condition per AAR Rule 41 standards) instead of UP's policy of 140 to 160 KIPS for notification of field personnel, this derailment may have been prevented.

Conclusion: FRA determined the high-impact load from wheel L2 on Car No. UCEX 2373 resulted in breaking the rail and was the probable cause of the accident. (Cause code E66C) Additionally, the failure to notify field personnel of the wayside detector alerts contributed to the cause of the accident. (Cause code H999)

Analysis - Cold Weather: In the derailment area, near Oshkosh, the temperatures were at or near record lows. The lows were -16°F and -25°F for March 3 and 4, respectively. UP records indicate a temperature of -15°F at the time of the derailment. Severe cold weather events such as these can put the rail in tension, making the rail more brittle. This could have increased the risk of a broken rail from a high-impact wheel.

Prior to the operation of Train 1, the entire South Morrill Subdivision was under a Cold Weather Restriction. Cold Weather Restrictions require all UP freight trains over 90 tons to operate at no greater than 40 mph. UP special track inspections are also required; however, no time frame is specified. The earliest track inspection occurred the morning of March 3, 2019, prior to the time of the derailment. The requirements of the Cold Weather Special Instructions were complied with by UP.

Conclusion: FRA determined that extreme cold weather did contribute to the cause of the accident. (Cause code M199)

Analysis - Track: This portion of the UP, South Morrill Subdivision consists entirely of two main tracks between MP 0.0 and MP 165.5. In the accident area, the two main tracks are separated with 20-foot track centers. Per UP documentation, the 2017 total tonnage figure for each main track between MP 0.0 and MP 165.5 was approximately 136.3 million gross tons.

Significant track structure damage in the immediate area of the derailment prevented detailed inspection of an intact track structure in the disturbed track area. During post-accident observations by investigators, they noted the track construction consisted of primarily 141-pound continuously-welded rail (CWR), head hardened, vacuum treated, and manufactured by Nippon, dated April 2010. The CWR was seated in 16-inch double shoulder tie plates that lay between the bottom surface of the rail and the top surface of concrete crossties, with 24-inch tie centers. The rail was fastened with Safe Lock One clips, a very common fastener used by UP. Track repairs consisted of 9 concrete panels on Main 2 and 16 wood panels on Main 1.

The overall condition of the ballast and geometry in the area just west of the track disturbed by the derailment, was compliant with all standards for FRA Class 3 Track. The overall crosstie conditions surpassed the minimum regulatory standards for sufficient number of crossties required in 39 feet and were distributed effectively. A review of inspection records relative to the area of the derailment revealed no previous associated track defects.

Conclusion: FRA determined that the condition of the rail did not contribute to the severity or cause of the broken rail; however, broken rail as the result of high impacts from wheel L2 on Car No. UCEX 2373 acting on extreme cold rail caused the derailment. (Cause code T299)

Overall Conclusion

The FRA investigation concluded Train 1, traveling in extreme cold weather on Main 2, derailed from a broken rail that was caused by the L2 wheel of UCEX 2373. Due to the significant track structure damage in the immediate area of the derailment, the broken rail section was not identified at the POD. Records indicate that Train 1 caused two other broken rails on Main 2, on the same rail, prior to the accident. No other trains traversed the track segment of the reported broken rails after Train 1.

The locomotives and cars inspected by FRA at North Platte did not show any wheel witness marks prior

to Car No. UCEX 2373. An examination of the trailing wheels on the north side of the track, after the high-impact wheel on Car No. UCEX 2373, showed witness marks consistent with a broken rail. The high-impact load from wheel L2 on Car No. UCEX 2373 caused the broken rail which resulted in a derailment of 35 railcars at MP 76.45. Car No. UCEX 2373 also had a visible condemnable wheel defect, a shelled spot greater than 2 ½ inches at the L2 location. WILD detectors are placed along the railroad's right-of-way to identify wheels that may have flat spots or other defects before a wheel can damage the railroad's track structure.

FRA has determined this derailment could have been prevented, had known defects identified by the wayside detectors been communicated to field personnel, which are typically addressed on other types of trains when they are yarded.

Probable Cause and Contributing Factors

The FRA's investigation determined the cause of the accident to be E66C -- Damaged flange or tread (flat).

FRA also determined T299 – Other rail defects; M199 -- Other extreme environmental conditions (extreme cold); and H999 – Other train operation/human factors (failure to identify and address high KIP wheel) were contributing causes to the accident.