Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch

Accident Investigation Report
HQ-2017-1204

Union Pacific Railroad Company (UP)
Mason City, IA
May 18, 2017

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 May 18, 2017, at 11:30 a.m., CDT, a southbound Union Pacific Railroad (UP) train derailed. The derailment occurred near Mason City, Iowa, at milepost (MP) 184.27, on the single main track of the Twin Cities Service Unit, Iowa Area, Mason City Subdivision.

Train Symbol MSSNP 18 consisted of 5 locomotives, 121 loads, and 25 empties. The train was traveling at a recorded speed of 33 mph when it experienced an undesired emergency brake application. A total of 32 cars derailed, including 2 hazardous materials cars. The derailed cars were the 87th through the 118th cars from the head-end of the train. The train crew reported having an uneventful trip prior to that point.

There were no injuries as a result of this accident and no release of hazardous materials. The equipment damage cost was $1,576,758; the track, signal, way, and structure damages were $381,930. The total monetary damages were $1,958,688.

At the time of the derailment, the weather was cloudy and raining with a temperature of 53° F.

The accident was caused by excessive buffing forces experienced by the train. According to the Federal Railroad Administration's (FRA) investigation, blocking this train in a different manner would have reduced the forces experienced. The FRA investigation concluded utilizing Primary Cause Code H504 - Buffing or slack action excessive, train make-up.

U.S. Department of Transportation
Federal Railroad Administration

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File #HQ-2017-1204

TRAIN SUMMARY

1. Name of Railroad Operating Train #1	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
Union Pacific Railroad Company	UP	0517TC009

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
Union Pacific Railroad Company	UP	0517TC009

2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident	4. Time of Accident/Incident
	5/18/2017	11:30 AM

5. Type of Accident/Incident
Derailment

6. Cars Carrying HAZMAT	7. HAZMAT Cars Damaged/Derailed	8. Cars Releasing HAZMAT	9. People Evacuated	10. Subdivision
7	2	0	0	Mason City

11. Nearest City/Town	12. Milepost *(to nearest tenth)*	13. State Abbr.	14. County
Mason City	184.27	IA	CERRO GORDO

15. Temperature (F)	16. Visibility	17. Weather	18. Type of Track
53 ˚F	Day	Rain	Main

19. Track Name/Number	20. FRA Track Class	21. Annual Track Density *(gross tons in millions)*	22. Time Table Direction
Single Main Track	Freight Trains-60, Passenger Trains-80	34.3	South

23. PTC Preventable
No

U.S. Department of Transportation
Federal Railroad Administration

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File #HQ-2017-1204

OPERATING TRAIN #1

1. Type of Equipment Consist:	2. Was Equipment Attended?	3. Train Number/Symbol
Freight Train	Yes	MSSNP-18

4. Speed (recorded speed, if available) R - Recorded E - Estimated	Code	5. Trailing Tons (gross excluding power units)	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
33.0 MPH	R	17112		0

6. Type of Territory

Signalization: Signaled

Method of Operation/Authority for Movement: Direct Train Control

Supplemental/Adjunct Codes: P, D

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.)*	MWCX 500372	87	no		0	0
(2) Causing *(if mechanical, cause reported)*	N/A	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	Mid Train c. Remote	Rear End d. Manual	Rear End e. Remote	11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	4	0	0	0	1	(1) Total in Equipment Consist	121	0	25	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	19	0	13	0	0

12. Equipment Damage This Consist	13. Track, Signal, Way & Structure Damage
1576758	381930

14. Primary Cause Code

H504 - Buffing or slack action excessive, train make-up

15. Contributing Cause Code

N/A - N/A

Number of Crew Members

16. Engineers/Operators	17. Firemen	18. Conductors	19. Brakemen
1	0	1	0

Length of Time on Duty

20. Engineer/Operator	21. Conductor
Hrs: 2 Mins: 30	Hrs: 2 Mins: 30

Casualties to:	22. Railroad Employees	23. Train Passengers	24. Others
Fatal	0	0	0
Nonfatal	0	0	0

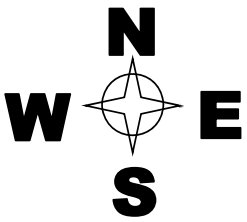
25. EOT Device?	26. Was EOT Device Properly Armed?
Yes	Yes

27. Caboose Occupied by Crew? N/A

28. Latitude	29. Longitude
43.037956000	-93.231362000

SKETCHES

Sketch - HQ-2017-1204 Sketch

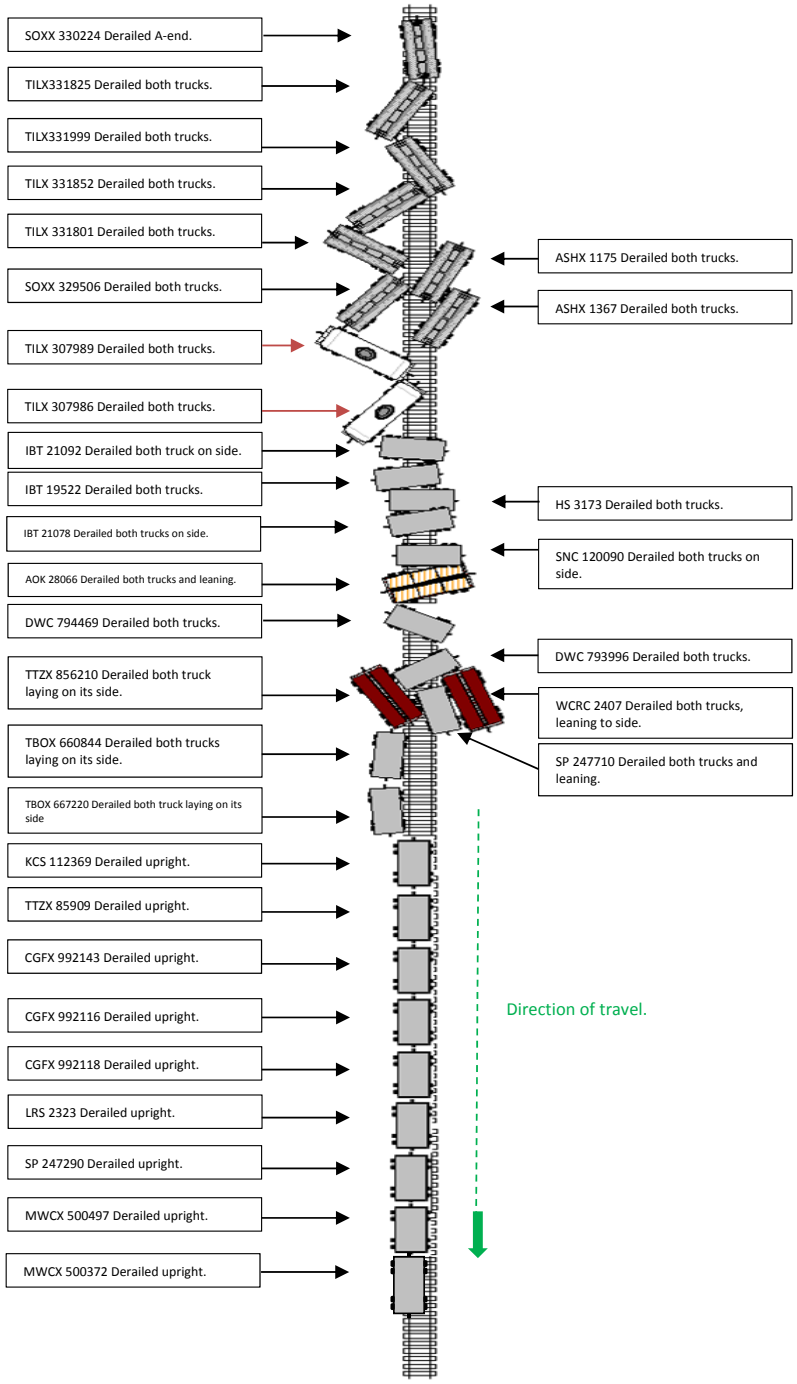


Train: MSSNP 18

Subdivision: Mason City

MP 184.05

→ Indicates HAZMAT



NARRATIVE

Circumstances Prior to the Accident

On May 18, 2017, at 9:00 a.m., CDT, a Union Pacific Railroad (UP) Boone, Iowa-based train crew consisting of an Engineer and Conductor went on duty at the UP Yard in Mason City, Iowa. This was their away-from-home terminal. Both crew members had received more than the statutory off-duty period prior to reporting for duty.

Their assigned freight train, MSSNP 18 (the train), consisted of 5 locomotives, one of which was a rear Distributed Power Unit (DPU), 121 loads, and 25 empties. The train had 18,138 tons (17,112 trailing tons) and was 8,590 feet in length. A Class I brake test and initial terminal inspection was completed in South St. Paul, Minnesota, on May 17, 2017, at 11:05 p.m. There was a total of 42 cars equipped with End-of-Car Cushioning (EOCC) devices. A single block included 33 of these equipped cars only separated by 1 car not equipped with an EOCC device, 15 of which were empty cars.
The crew departed southbound on the Mason City Subdivision. There was no work performed en route after departing Mason City, and the trip was uneventful prior to the Point of Derailment (POD).

In the area of the derailment, the Mason City Subdivision consists of a single main track. The method of operation is by track warrant control, supplemented by an Automatic Block Signal (ABS) system as indicated by the railroad timetable.

Both the timetable and geographical direction were south as the train approached the accident area. Timetable direction will be used throughout this report. The Engineer was seated at the controls on the west side of the leading locomotive, and the Conductor was seated on the east side of the cab.

The Accident

The train was being operated at 34 mph approaching the derailment area. According to the train crew, they did not observe or feel anything unusual prior to the incident. The speed at the time of the derailment was 33 mph. Both the approach speed and the speed at the time of derailment were recorded by the event recorders of the locomotives in the consist.

The controlling locomotive incorrectly recorded a speed of 11 mph at the time of the derailment, which is inconsistent with the other three locomotives on line with event recorders. Maximum authorized speed for this train was 50 mph, as designated in the current UP, Iowa Area Timetable No. 5.

The train experienced an undesired emergency application of the air brake system at the POD, milepost (MP) 184.27, at 11:30 a.m., CDT. The lead locomotive came to a stop at approximately MP 182.5. The Engineer stayed on the locomotive to establish radio communications with the Train Dispatcher. The Conductor walked back and discovered the 87th through 118th head cars had derailed. Two of the derailed cars contained hazardous material; however, neither released any hazardous material.

UP dispatched a Senior Manager of Terminal Operations, a Special Agent, a Manager of Hazardous Materials, and a Manager of Safety Derailment Prevention as members of its go team together with representatives from the risk management team to the scene. Various members of the UP's Operating, Mechanical, and Engineering departments were also dispatched and present to investigate and aid in remediation of damages associated with the derailment.

Re-railing services were provided by Hulcher Professional Services Inc., which dispatched three divisions including the Hudson, Grand Island, and Des Moines Divisions. The first crew arrived at 4:00 p.m., CDT, the day of the derailment, and all were released by 5:00 p.m., CDT, on May 19, 2017.

The Rockwell Fire Department arrived and remained on scene until it had received confirmation there was no hazardous materials released.
There were no injuries as a result of this accident and no release of hazardous materials. The equipment damage cost was $1,576,758; the track, signal, way, and structure damages were $381,930. The total monetary damages were $1,958,688.

At the time of the derailment, the weather was cloudy and raining with a temperature of 53° F.

Analysis and Conclusion
Analysis - Toxicological Testing: Federal Railroad Administration (FRA) post-accident toxicological testing was performed on both crew members. The test results obtained from the FRA Alcohol and Drug Control Program Manager were negative for both employees.

Conclusion: FRA determined drugs and alcohol did not contribute to the cause or severity of this derailment.

Analysis - Fatigue: FRA uses an overall effectiveness rate of 77.5 percent as the baseline for fatigue analysis, which is equivalent to a blood alcohol content of 0.05. At or above this baseline, FRA does not consider fatigue as probable for an employee. Software sleep settings vary according to information obtained from each employee. If an employee does not provide sleep information, FRA uses the default software settings.
FRA obtained fatigue-related information for the 10-day period preceding this accident, including the 10-day work history (on-duty/off-duty cycles) for all the employees involved.

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

Analysis-Locomotive Engineer Operating Performance: The train’s locomotives were equipped with speed indicators and event recorders as required. The recorders on all locomotives were downloaded and analyzed by UP officials.

Conclusion: FRA determined the Locomotive Engineer was in compliance with all applicable railroad-operating and train-handling requirements.

Analysis- Mechanical and Safety Devices: The train received a Class I brake test and initial terminal inspection at South St. Paul. The leading locomotive was equipped with a headlight, the auxiliary lights, and the audible warning device required by Federal regulations. Following the accident, UP mechanical forces inspected the locomotives for proper working condition of the braking system. Based on those results, equipment was excluded as contributing to the cause of the accident.

Conclusion: FRA determined the train's brakes and the locomotive safety devices were in full compliance with Federal requirements.

Analysis - Track Structure and Signal Appliances: The derailment occurred on the single main track of the Mason City Subdivision. The investigation revealed that the track in this area is tangent track with approximately 1,150 feet of elevation. The track is well maintained with level footing and good visibility in both directions. The ABS system, track, or impaired visibility did not play a role in the derailment.

Conclusion: FRA determined track, signals, and visibility did not contribute to the cause or severity of this derailment.

Analysis - Train Consist: The investigation revealed that the train involved in the derailment consisted of a total of 146 cars, 25 of which were empty cars. There was a total of 42 cars equipped with EOCC devices. A single block included 33 of these cars, only separated by one car not equipped with an EOCC device, 15 of which were empty cars.

The train make-up was such that most of the empty cars, including the derailed portion, were followed by a group of loaded cars and a DPU locomotive on the rear of the train. This grouping of empty cars equipped with EOCC devices followed by loaded cars and a DPU produced the excess of 300 Kilopounds (KIPs) experienced, which is well over the 250 KIP threshold allowed by UP.

Both UP and FRA processed this train through simulators - UP through Train Operations and Energy Simulator (TOES); the FRA through the Train Energy and Dynamics Simulator (TEDS). In both simulations, excessive buffing forces were experienced due to the placement of the EOCC block of cars in mid-train, and verified by both TEDS and TOES.

Conclusion: FRA determined excessive buff force on the empty cars mid-train was the primary cause of this derailment.

Overall Conclusions

The railroad was in full compliance with its own standards and all applicable Federal standards. The train crewmembers had no information that could be used to determine the cause of the derailment.

The FRA investigation discovered during the TEDS and TOES data review that excessive buffing forces in excess of 300 KIPs were experienced by the train due to the placement of the EOCC-equipped cars

within the train. As a result, the blocking was changed to place this EOCC block closer to the DPU at the rear of the train. These simulations indicated that it would have significantly reduced the buffing forces well below UP's threshold of 250 KIPs maximum.

In response to derailment prevention analysis of the train, UP has established a new block and placement requirement that requires the placement of these EOCC cars (loads and empties) at the rear of the trains. By doing this, it substantially reduces the risk of derailment of similar large trains operating over undulating territory.

Probable Cause and Contributing Factors

The FRA determined the probable cause of the derailment is cause code H504 -- Buffing or slack action excessive, train make-up. There was no contributing cause code for this accident.