



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

***Accident Investigation Report
HQ-2019-1363***

***Union Pacific Railroad Company (UP) Derailment
Dupo, Illinois
September 10, 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 September 10, 2019, at approximately 12:30 p.m. CDT, Union Pacific Railroad Company (UP) Train YDU51-10 (Train 1), derailed 14 cars on the UP Mid-America Service Unit, Chester Subdivision, at Milepost (MP) 5.79 in the UP's Dupo Yard, Dupo, Illinois.

The derailment resulted in a breach to a rail car containing hazardous material (Methyl Isobutyl Keytone), resulting in an explosion and fire.

An evacuation of 1,147 people was ordered by the Dupo, Illinois, Fire Department, until it was determined that the air quality was safe to return. The Dupo Schools also evacuated 1,011 students after the fire spread underground through a storm drain and caught the holding pond next to Vertex chemical plant on fire.

There were no reported injuries to the community or to the crew.

At the time of the accident, it was daylight and clear. The temperature was 91°F. Damages included \$711,345 to the equipment and \$104,720 to the track and structures.

The Federal Railroad Administration (FRA) investigation determined the cause to be H503 - Buffing or slack action, train handling. Contributing cause code E30C – Knuckle broken or defective.

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 Union Pacific Railroad Company	1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. 0919MA023
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GENERAL INFORMATION

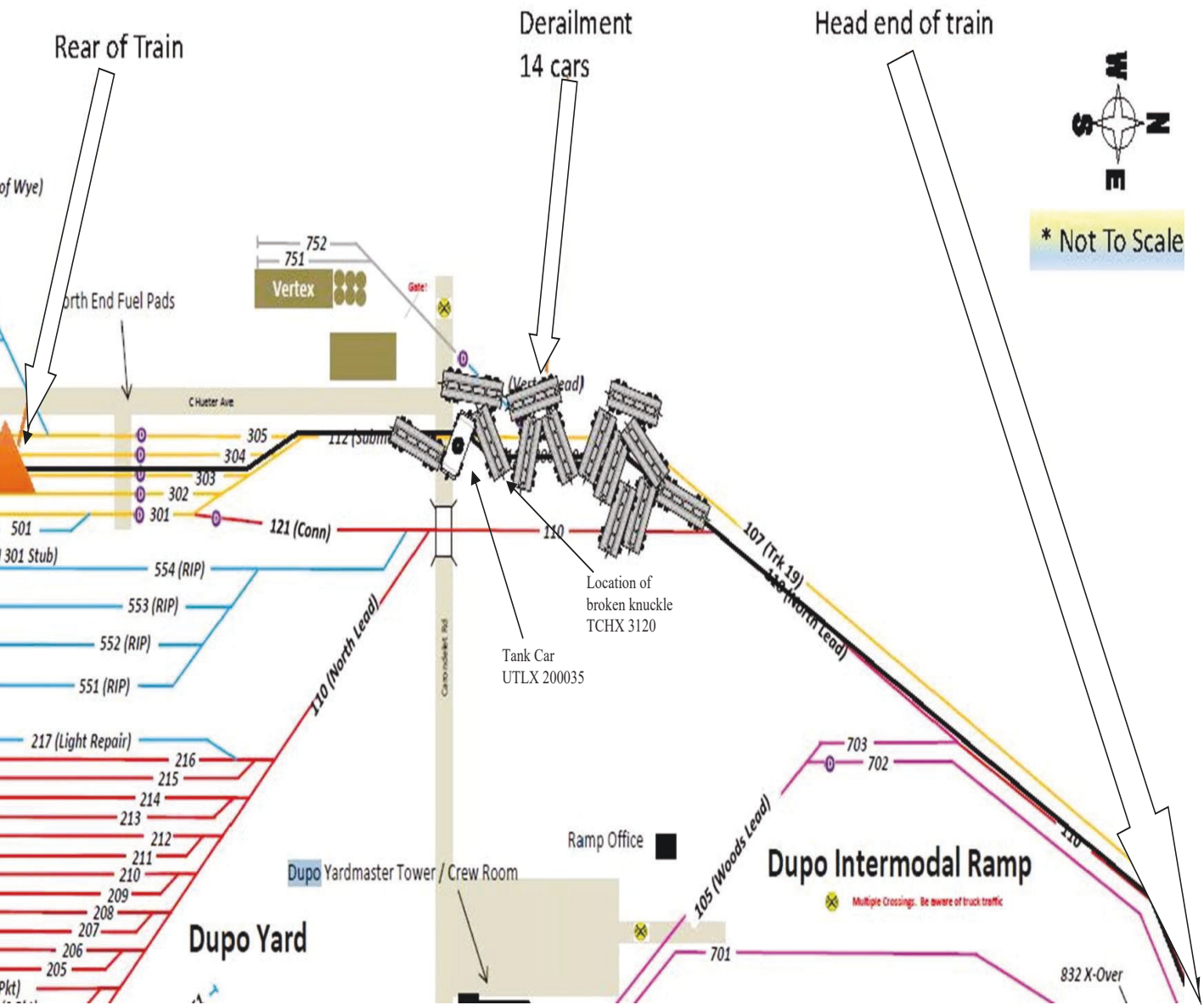
1. Name of Railroad or Other Entity Responsible for Track Maintenance Union Pacific Railroad Company		1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. 0919MA023	
2. U.S. DOT Grade Crossing Identification Number		3. Date of Accident/Incident 9/10/2019	4. Time of Accident/Incident 12:30 PM	
5. Type of Accident/Incident Derailment				
6. Cars Carrying HAZMAT 24	7. HAZMAT Cars Damaged/Derailed 1	8. Cars Releasing HAZMAT 1	9. People Evacuated 2158	
10. Subdivision UNION PACIFIC RAILROAD COMPANY - CHESTER				
11. Nearest City/Town Dupo		12. Milepost (to nearest tenth) 5.4	13. State Abbr. IL	14. County ST CLAIR
15. Temperature (F) 91 °F	16. Visibility Day	17. Weather Clear		18. Type of Track Yard
19. Track Name/Number Track 111		20. FRA Track Class Freight Trains-10, Passenger Trains-15		21. Annual Track Density (gross tons in millions) 22. Time Table Direction South
23. PTC Preventable No		24. Primary Cause Code [H503] Buffing or slack action excessi		25. Contributing Cause Code(s) E30C

OPERATING TRAIN #1

1. Type of Equipment Consist: Yard/Switching					2. Was Equipment Attended? Yes			3. Train Number/Symbol YDU51-10			
4. Speed (recorded speed, if available) R - Recorded 11.0 MPH E - Estimated		Code R	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 0	
6. Type of Territory Signalization: <u>Not Signaled</u> Method of Operation/Authority for Movement: <u>Other Than Main Track</u> Supplemental/Adjunct Codes: _____											
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>		UTLX 200035	84	yes				0	1		
(2) Causing <i>(if mechanical, cause reported)</i>		N/A	0	no	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	64	
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	8	0	6	0	0
12. Equipment Damage This Consist 711345			13. Track, Signal, Way & Structure Damage 104720								
Number of Crew Members						Length of Time on Duty					
14. Engineers/Operators 1		15. Firemen 0		16. Conductors 1		17. Brakemen 1		18. Engineer/Operator Hrs: 6 Mins: 0		19. Conductor Hrs: 6 Mins: 0	
Casualties to:		20. Railroad Employees		21. Train Passengers		22. Others		23. EOT Device? No		24. Was EOT Device Properly Armed? N/A	
Fatal		0		0		0		25. Caboose Occupied by Crew?		N/A	
Nonfatal		0		0		0					
26. Latitude 38.528708000				27. Longitude -90.209247000							

SKETCHES

Sketch - Sketch



NARRATIVE

Circumstances Prior to the Accident

Union Pacific Railroad (UP) Train Symbol YDU51-10 (Train 1) was assigned the job of gathering up and moving rail cars from the 200 Yard to the 300 Yard, to assemble an outbound train on track 303. The locomotive engineer was using a consist that included UP 7031, UP 9060, and UP 6406. Locomotives UP 7031 and UP 9060 were on-line and providing traction power to the train.

The crew of Train 1 consisted of a locomotive engineer, a foreman, and a helper. They went on duty at 6:30 a.m., CDT, September 10, 2019, at the UP's Dupo Yard Office in Dupo, Illinois. This is the home terminal for all crew members; they all had received more than the statutory off-duty period prior to reporting for duty. All times indicated throughout this report will reflect CDT.

Train 1 was operating on the UP Mid-America Service Unit, Chester Subdivision, at Milepost (MP) 5.79 in UP's Dupo Yard, Dupo. Timetable and geographic direction for Dupo Yard are both south. Yard 200 parallels Yard 300 to the east within Dupo Yard. As trains traverse north they utilize tracks 110 north lead and track 111 to move between Yard 200 and Yard 300. Carondelet Avenue crosses track 111 just north of 300 Yard. The maximum authorized speed for this yard move was 10 mph, as designated in the current UP St. Louis Area Timetable No. 5.

The outbound train being built was scheduled to depart Dupo Yard with 183 cars and four locomotives. The rear 43 cars and mid-train Distributed Power (DP) locomotive, UP 8110, were already in the 300 Yard, in track 302. Upon building the remainder of the train, Train 1 began to pull the cars north from the 200 Yard on track 110 North Lead towards the north end of Dupo Yard. Train 1 was moving 140 cars, 10,206 tons, 8,008 feet, with no air on the cars. These cars were to be placed on track 303 for inspection by the mechanical department. After the rear car of the move had cleared the north switch of Track No. 111, the foreman stopped the move and lined the switch for movement from track 110 north lead to track 111. He then boarded the west side of the lead car to protect a shove move south on Track No. 111 towards 300 Yard. The foreman gave the locomotive engineer a distance of 50 car lengths; Train 1 started shoving south.

The helper was positioned ahead of the shoving movement, at the highway rail grade crossing at Carondelet Avenue, to protect the movement over the crossing. The locomotive engineer was seated at the control stand of the lead locomotive, facing north, and using the mirror outside the engineer's cab window to observe the equipment during the southward movement.

As Train 1 was shoving south, the locomotive engineer was using dynamic and independent braking to control the movement. As he approached the Carondelet Avenue grade crossing located north of Yard 300, he applied full independent brakes with the locomotive in dynamic 2, increasing to dynamic 5, at a speed of 4 mph. The engineer then released the independent brake and fully applied it again. This resulted in excessive slack action, which caused a knuckle failure on the north end of TCHX 3120,

located 87 cars from the locomotive consist. The foreman, recalled during his interview that approximately six cars from the crossing they encountered severe slack action with the train. The failure of the knuckle allowed the lead 54 cars of the shove to continue rolling to the south. The locomotives and the head 86 cars came to a stop.

The crew was not aware of the knuckle failure and the separation of the equipment that resulted. The foreman continued to ride the lead car to the north end of the 300 Yard, which now was a free rolling cut of 54 cars. When he arrived at the north end of the 300 Yard, he dismounted the still-moving equipment and got in the company vehicle with the helper to continue the shove protection. The foreman and helper saw the track was clear, as they proceeded south in the vehicle to protect the move and instructed the locomotive engineer to continue the shove south 100 car lengths into track 303.

After the separation, the lead 54 cars had continued rolling freely in a southward direction until the cars stopped, reversed movement, and began rolling back north towards the remainder of the equipment being shoved south.

The Accident

At 12:29 p.m., as Train 1 was shoving south towards Track No. 303 with the head 86 cars the train collided with the 54 free-rolling cars. At the time of impact the head end locomotive speed indicator showed a speed of 11 mph. The locomotive engineer continued to shove an additional 358 feet, before coming to a stop.

The force of the collision resulted in SRCX 4055 (86 cars from the head end) and SHQX 2556 (85 cars from the head end) being knocked clear of, and to the west of, Track 111. With SRCX 4055 and SHQX 2556 knocked clear of Track 111, this allowed TCHX 3120 (87 cars from the head end) to strike and puncture UTLX 200035 (84 cars from the head end), resulting in an explosion and a fire. A total of 14 cars were derailed as a result of the collision (UP 78351 located 74 cars from the head end through TCHX 3120 located 87 cars from the head end). FHRX 628621 and KLRX 47482 both sustained major fire damage, but did not derail. ETTX 700371 and ETTX 705263 sustained minor fire damage, and did not derail.

The speed of the consist being shoved was recorded by the event recorder of the controlling locomotive.

An evacuation of 1,147 people was ordered by the Dupou, Illinois, Fire Department, until it was determined that the air quality was safe to return. The Dupou School District also evacuated 1,011 students after the fire spread underground through a storm drain and caught the holding pond next to Vertex chemical plant on fire.

No injuries were reported to the community or to the crew.

Total damage for the derailment was estimated at \$711,345 to the equipment and \$104,720 to the track and structures.

Post-Accident Investigation

Investigative Teams from the UP, Federal Railroad Administration (FRA), and Illinois Commerce Commission (ICC) arrived on-scene throughout the evening of September 10, 2019. The FRA and ICC inspectors began the investigation by obtaining documents, crew member statements, and photographing the accident scene.

The FRA interviews and review of the event data recorder verified the train crew's account of the accident. The investigators also reviewed track inspection and equipment maintenance inspection records, as well as crew training, testing, and certification. The review of the locomotive event recorder download indicates train handling was a factor. Federal post-accident toxicological testing was conducted.

Analysis and Conclusion

Analysis – Motive Power and Equipment: A review of records of tests and inspections of the equipment involved show no defects or other conditions were present at the time of the accident.

The broken knuckle was recovered approximately 28 car lengths from the point of derailment and was determined to be a new break. Upon inspection of the knuckle there was no evidence of a preexisting defect present, indicating train handling was the cause for failure.

The broken knuckle was not determined to be defective; there was no evidence of a preexisting defective condition. However, had the knuckle brake not occurred the accident would not have happened.

Conclusion: FRA determined the broken knuckle did contribute to the cause or severity of the accident.

Analysis - Toxicological Testing: The locomotive engineer, foreman, and helper of Train 1 were transported to Touchette Regional Hospital, in Centreville, Illinois, for blood, breath, and urine testing. FRA Post-Accident Forensic Toxicology Result Reports indicate of the three employees tested, the engineer and one conductor (also identified as a foreman), each had negative test results.

The helper was positive for the narcotic, tramadol, in his urine. This employee's blood result for tramadol was negative. The confirmed presence of the drug reveals previous use of tramadol within the past one to two days. The helper's urine concentration by itself does not independently provide evidence that the employee's performance or judgment was impaired at the time of the accident by either use of the drug or the medical issue for which the drug was used.

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

Analysis - Fatigue: FRA uses an overall effectiveness rate of 72 or less for 80 percent or more of the time as the baseline for fatigue analysis. This is the level at which the risk of a human factors-related accident is calculated to be equal to chance. Below this baseline, fatigue is not considered 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, including work history, for all train operating employees involved in this accident. Based on the Fatigue Audit InterDyne (FAID) analysis, fatigue was not probable for any of the crew members involved in the accident.

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

Analysis – Train Crew Performance: The investigation revealed as the shove was being made, the locomotive engineer used the independent and dynamic brake on his locomotive consist to attempt slowing and controlling the movement. The UP had no instructions in place that would require the crew to place air on any of the cars being handled. Without air being supplied to each car in the train, the engineer did not have the ability to activate the brakes on the cars themselves and could only apply brakes on the locomotives, i.e., independent and dynamic braking.

The locomotive engineer's use of the full independent brake with 140 cars bunched up (no slack), caused severe slack action when the locomotive engineer made a full independent brake application, resulting in a broken knuckle on the north end (B-End) of Car TCHX 3120. The locomotive engineer failed to limit draft forces when applying full independent brake twice to slow the train. The foreman's report of interview further supports severe slack action was present at the crossing prior to the foreman getting off equipment at the north end of 300 Yard.

Following the broken knuckle, Car TCHX 3120 located 87 cars from the head end separated from Car SRCX 4055 located 86 cars from the head end. The broken knuckle resulted in 54 cars rolling freely ahead of the shove move. These 54 cars rolled southward to MP 6.01 which is approximately 1,000 feet beyond Carondelet Avenue where the foreman dismounted the rear car. Of the 54 free-rolling cars, the head seven cars south of the broken knuckle were all loaded mixed freight cars. Crew interviews indicate that the foreman and helper had no idea that the cars were not still connected to the remainder of the train. The foreman joined the helper in the vehicle, that was parked at the north end of the 300 Yard to protect the movement and proceeded southward along the right-of-way, while instructing the engineer to continue south.

As the crew members moved south to protect the shove movement, the 54 cars began rolling back north, towards the shove move that was continuing with the remaining 86 cars. Shortly thereafter, car TCHX 3120, located 87 cars from the head end, collided with the shove move and the lead car at the time, SRCX 4055, 86 cars from the head end on Track 111.

In accordance with UP Air Brakes and Train Handling rule 34.2.12, the locomotive engineer should have gradually stretched cars and taken care to limit draft forces to avoid damage to equipment; he failed to do so when he applied full independent brake to a bunched up cut of 140 cars, in an attempt to control the train as it approached a grade crossing.

The locomotive engineer's performance was inconsistent with good train handling and not in compliance

with UP operating standards and instructions. The locomotive engineer's use of the independent brake without allowing for a gradual runout of slack, creating an excessive amount of draft forces, was the cause of the accident.

Conclusion: FRA determined the locomotive engineer's performance caused the accident.

The actions of the foreman and helper did not contribute to the accident.

Overall Conclusion

FRA determined that the locomotive engineer's use of the independent brake without allowing for a gradual runout of slack, creating an excessive amount of draft forces, was the cause of the derailment.

The broken knuckle was not determined to be defective; there was no evidence of a preexisting defective condition.

This accident was not PTC preventable.

Probable Cause

FRA investigation determined the probable cause of the accident was H503 -- Buffing or slack action, train handling.

Additionally, the FRA determined a contributing cause of the accident was E30C – Knuckle broken or defective.