



***Federal Railroad Administration
Office of Railroad Safety***

***Accident Investigation Report
HQ-2020-1399***

***Kansas City Southern Railway Company (KCS) Derailment
Mauriceville, Texas
October 29, 2020***

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 October 29, 2020, at approximately 7:25 a.m., CDT, a Kansas City Southern Railway Company (KCS) northbound (timetable direction) mixed freight train (MBMSH-29), handling 95 loads, 60 empties with 4 locomotives (configured 4 x 0) at an estimated speed of 39 mph derailed 25 (15 loaded and 10 empty) cars at Milepost (MP) 750.2 on the Beaumont Subdivision at Mauriceville -- approximately 16.4 miles northeast of Beaumont in Orange County, Texas.

The method of operation for the Beaumont Subdivision (Southwest Division) is Signal Indication under Centralized Traffic Control (CTC) with Positive Train Control (PTC) and a maximum authorized speed of 55 mph for freight trains – unless otherwise restricted per KCS's Beaumont Subdivision Timetable #15, effective April 1, 2020. KCS System Special Instructions dated April 1, 2020, further restrict trains handling toxic inhalation or poison inhalation hazards (TIP/PIH) to 50 mph.

Car numbers 84-108 derailed and a total of 6 cars were punctured, two of which contained hazardous material that is required to be placarded. Lines 84 and 89 contained non-hazardous Glycol; lines 94 and 95 contained fuel oil; and lines 101 and 102 contained UN 2491 Ethanolamine. In addition, line 105 containing poison inhalation hazard (PIH-UN 1040) derailed but was not punctured or breached.

The derailment led to approximately 600 people being evacuated, including the Mauriceville Middle School, which is located 400 yards from the derailment. The Ethanolamine released in this derailment flowed into an adjacent ditch connecting to the Adams Bayou approximately 700 yards from the accident site. The derailment also knocked out power to approximately 2,500 Entergy Texas customers, which includes a Mauriceville water pumping station and adjacent sewage pumping station.

There were no reported injuries or fatalities to KCS crew or the public.

This is not an Amtrak route, and was not PTC preventable.

Weather at the time of the derailment was described as clear, day, and 45°F.

Total estimated damages were \$2,187,334 (Track: \$970,289 / Equipment: \$1,217,045).

The Federal Railroad Administration (FRA) determined the probable cause to be T207 Broken Rail -- Detail fracture from shelling or head check.

**TRAIN SUMMARY**

1. Name of Railroad Operating Train #1 Kansas City Southern Railway Company	1a. Alphabetic Code KCS	1b. Railroad Accident/Incident No. 20102903
--	----------------------------	--

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance Kansas City Southern Railway Company	1a. Alphabetic Code KCS	1b. Railroad Accident/Incident No. 20102903
---	----------------------------	--

2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident 10/29/2020	4. Time of Accident/Incident 7:25 AM
--	--	---

5. Type of Accident/Incident Derailment
--

6. Cars Carrying HAZMAT 73	7. HAZMAT Cars Damaged/Derailed 6	8. Cars Releasing HAZMAT 2	9. People Evacuated 600
-------------------------------	--------------------------------------	-------------------------------	----------------------------

10. Subdivision KANSAS CITY SOUTHERN - BEAUMONT
--

11. Nearest City/Town MAURICEVILLE	12. Milepost (<i>to nearest tenth</i>) 750.2	13. State Abbr. TX	14. County ORANGE
---------------------------------------	---	-----------------------	----------------------

15. Temperature (F) 45 °F	16. Visibility Day	17. Weather Clear	18. Type of Track Main
------------------------------	-----------------------	----------------------	---------------------------

19. Track Name/Number SIMN	20. FRA Track Class Freight Trains-60, Passenger Trains-80	21. Annual Track Density (<i>gross tons in millions</i>) 32.44	22. Time Table Direction North
-------------------------------	---	--	-----------------------------------

23. PTC Preventable No	24. Primary Cause Code [T207] Broken Rail - Detail fracture fr	25. Contributing Cause Code(s)
---------------------------	---	--------------------------------

1. Type of Equipment Consist: Freight Train						2. Was Equipment Attended? Yes		3. Train Number/Symbol MBMSH-29					
4. Speed (recorded speed, if available) R - Recorded 39.0 MPH E - Estimated		Code E	5. Trailing Tons (gross excluding power units) 14044		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> J, Q </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.)		ADMX25849		88		yes				0		0	
(2) Causing (if mechanical, cause reported)		0		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		
			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	0	0	(1) Total in Equipment Consist		95	0	60	0	0
(2) Total Derailed		0	0	0	0	0	(2) Total Derailed		15	0	10	0	0
12. Equipment Damage This Consist 1217045			13. Track, Signal, Way & Structure Damage 970289										
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: 25		19. Conductor Hrs: 3 Mins: 25			
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 30.202878000				27. Longitude -93.867046000									

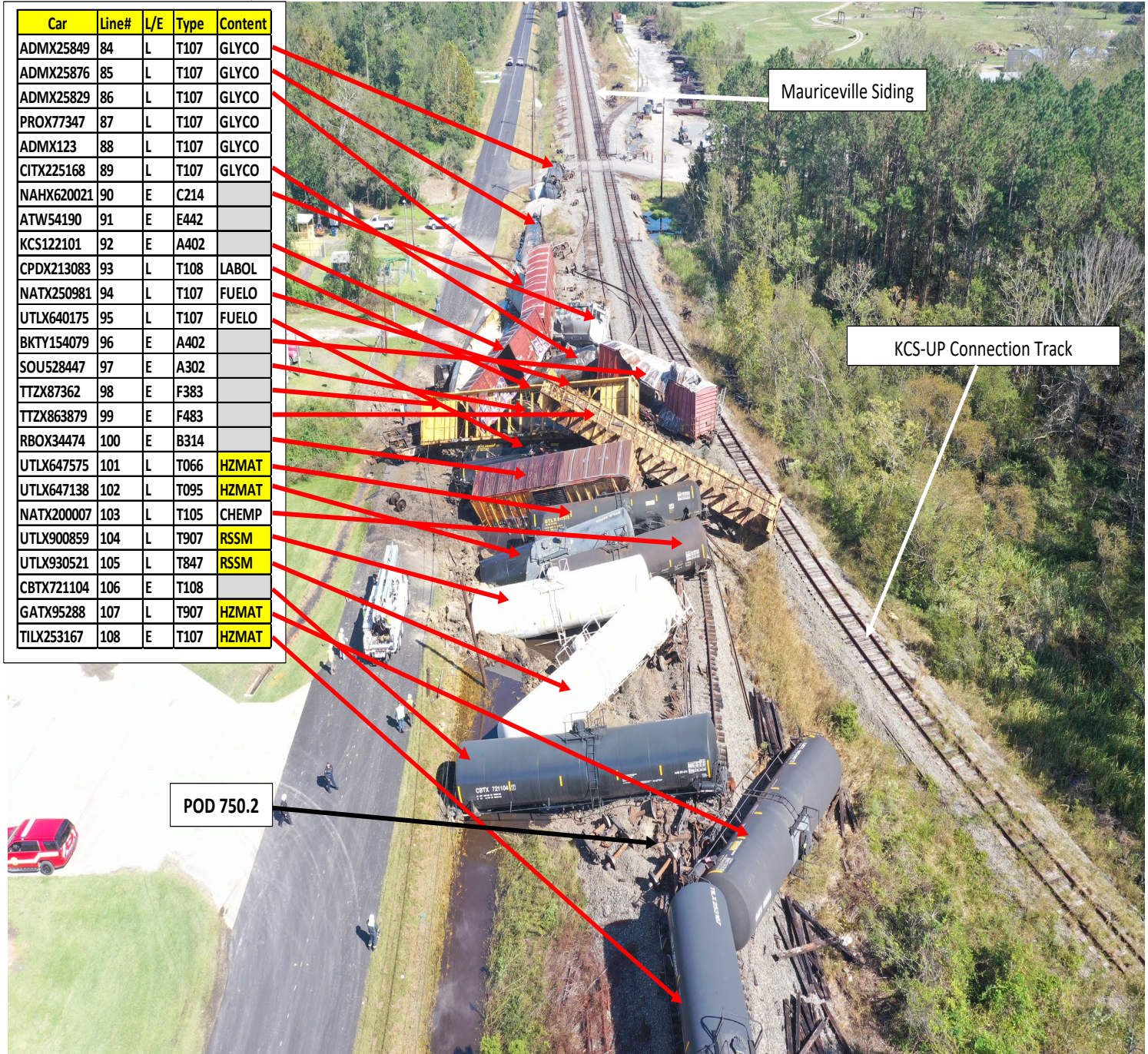


SKETCHES

Sketch - Sketch

KCS Derailment Mauriceville, TX MP750.2 October 29, 2020 7:23AM CDT View North

HQ-2020-1399





NARRATIVE

Circumstance Prior to the Accident

Kansas City Southern Railway Company's (KCS) MBMSH-29 (Train 1) was assembled in KCS's Beaumont Yard on October 28, 2020. Train 1 consisted of 4 locomotives, 95 loaded and 60 empty freight cars, was 8,764 feet long, and had 14,044 trailing tons. Train 1 had 73 hazardous material cars. All required tests and inspections were completed on October 29, 2020, at 2:19 a.m., CDT, by KCS conductor who built the train at Beaumont, Texas. The lead locomotive, EMDX 7233, was not equipped with positive train control (PTC) or Trip Optimizer.

The crew of Train 1 went on duty at Beaumont Yard at 4 a.m., CDT, on October 29, 2020. Both crew members had received more than the required statutory hours of rest prior to call.

The accident occurred on the KCS Beaumont Subdivision. In the area of the derailment, the Beaumont subdivision consists of a single main track that operates time table south, with a maximum authorized speed of 50 mph. Train 1 was further restricted to a maximum authorized speed of 40 mph due to equipment restrictions. The method of operation for this subdivision is signal indication, and is dispatched using a centralized traffic control system, and has an active PTC system. There is a 10,528-foot siding at Milepost (MP) 750.2, with the entrance controlled by Control Point (CP) South Mauriceville.

Beginning at MP 751, heading south, the track is tangent with a relatively level grade. At MP 750.2, there is a right-hand, No. 16 turnout into Mauriceville Siding.

Train 1 was traveling north, at a recorded speed of 39 mph, as it approached the interlocking.

The crew did not report any issues with the train after departure and approaching the derailment, nor did they complete any work between departure and the derailment.

At the time of the derailment, it was daylight, clear, and 45 °F.

The Accident

At approximately 7:25 a.m., CDT, on October 29, 2020, Train 1 derailed 25 cars (15 loaded, 10 empty) at MP 750.2, at an estimated head end speed of 39 mph. The derailment involved consist lines 84-108 (inclusive), totaling 25 cars with all the cars turned over or jackknifed.

A total of six cars were punctured, two of which contained hazardous material. Lines 84 and 89 contained non-hazardous Glycol; lines 94 and 95 contained fuel oil; and lines 101 and 102 contained UN 2491 Ethanolamine. In addition, line 105 contained poisonous inhalation hazard (PIH) UN 1040, but was not punctured or breached. Three of the 6 cars that were breached released an estimated 74,428 gallons of ethanol, which were allowed to evaporate in place. The Ethanolamine released in this derailment flowed into an adjacent ditch which led to the Adams Bayou, approximately 700 yards from

the accident site. Hazardous Material response crews dammed the ditch to stop the run-off.

Additionally, two cars carrying ethylene oxide, a colorless, highly flammable liquid, derailed but did not rupture even though the tanks were separated from their wheels and undercarriages in the crash. The leaks were contained, and the product was containerized for proper disposal.

The derailment led to approximately 600 people being evacuated, including the Mauriceville Middle School, which is located 400 yards away from the derailment.

At the time of the derailment, the engineer was located at the controls of the lead locomotive, while the conductor was in the conductor's seat.

Post-Accident Investigation

The accident was investigated by the Federal Railroad Administration (FRA) in conjunction with the Texas Commission on Environmental Quality, Department of Public Safety, Orange County Department of Emergency Services, and KCS management personnel from the Operating, Mechanical, Track, and Hazardous Material disciplines.

Analysis and Conclusions

Analysis Toxicology: This accident met the minimum requirements of Title 49 Code of Federal Regulations (CFR) § 219, and toxicological testing was accomplished. FRA Post-Accident Forensic Toxicology Result Reports indicate the two employees tested each had negative test results.

Conclusion: FRA determined that neither drugs nor alcohol were primary or contributory to the accident.

Analysis – Operating Practices: The engineer and conductor were found to be compliant with all applicable FRA Regulations, railroad operating, and train handling rules and requirements. The relevant event and video recorder data was downloaded by KCS and analyzed by FRA and KCS with no exceptions noted.

Conclusion: FRA determined operating practices were not the primary or a contributing cause in the accident.

Analysis – Mechanical: The derailment involved consist lines 84-108, totaling 25 cars. There were no exceptions noted by FRA or the KCS Mechanical Department on any of the derailed cars following inspection. Inspections of cars lines 106 and after had no exceptions taken.

Inspections of the cars ahead of the derailed cars found observations of horizontal batter marks consistent with broken rail rising to strike on-coming wheel treads. These batter marks were found on:

- Line 76- TILX 284294 R-1-wheel tread;

- Line 77- TILX 270064 L-2-wheel tread;
- Line 80- UTLX 666610 L-2-wheel tread;
- Line 83- DBUX 250915 L-4-wheel tread; and,
- Line 84- ADMX 25849, which was the first car derailed.

All wheel tread marks were on the conductor's side of the train (north side of train).

Six cars were punctured, two of which contained hazardous materials. Lines 84 and 89 contained non-hazardous Glycol; lines 94 and 95 contained fuel oil; and lines 101 and 102 contained UN 2491 Ethanolamine. Line 105 contained PIH UN 1040, but was not punctured or breached.

Point of Release Summary forensics were completed and attached to this investigation.

Conclusion: FRA determined the mechanical condition of the equipment did not contribute to the cause or severity of the derailment.

Analysis – Track & Structures: KCS's Beaumont Subdivision consists of 209.1 miles of single main track with multiple passing sidings. The Beaumont Subdivision extends timetable south from Frierson, Louisiana (MP 577.0), southward to Port Arthur, Texas (MP 786.1). Trains and/or equipment operating on the Beaumont Subdivision utilize Central Traffic Control (CTC) and GCOR Rule 6.28, as listed in System Timetable No. 15, effective 00:01, April 1, 2020. Trains operate at a maximum speed for freight of 55 mph, and 59 mph for intermodal trains.

Traveling timetable north on the Beaumont Subdivision from Beaumont, the location of Train 1 prior to the point of derailment (POD) 750.2, Train 1 traversed one 8° curve at MP 766.7, which is timetabled at 10 mph. The remainder of the Beaumont Subdivision the train traversed is all tangent to the POD at MP 750.2.

CP South Mauriceville is located just east (railroad north) of the Texas Highway 62 overpass, and the Mauriceville middle and elementary schools. CP South Mauriceville consisted of a crossing diamond located at the southern part of the CP that connects the Sabine River and Northern Railroad to the Union Pacific Railroad (UP). Approximately 200 feet north of the crossing diamond is the South Mauriceville Switch, which leads to the Mauriceville Siding. The crossing diamond itself has a permanent FRA Class 3, 40 mph speed restriction within CP South Mauriceville. The actual switch at the POD is FRA Class 4. This segment of track where the derailment took place runs parallel to Farm to Market Road (FM) 1130, which is a county-maintained road. Just north of the POD is old Highway 62 (DOT 329457H), which crosses the main and siding. To the west of the main (physical north) is a county-maintained drainage ditch that runs between FM 1130 and the main. This ditch runs north and crosses under the main 1 mile north of the POD and turns into the Adams Bayou.

The investigation determined the POD to be at MP 750.2, where the train was traversing through the CP South Mauriceville, with 4 locomotives and 155 miscellaneous freight cars consisting of 95 loads and 60

empties, with 14,044 trailing tons at a length of 8,764 feet. Train 1 contained 73 hazardous placarded cars out of the 155 cars on the train.

The last FRA geometry car run over the track leading up to the POD was on April 29, 2018, noting three defects between MP 577.0 and MP 786.1, with the closest defect being at MP 765.

KCS track inspection records show that between October 2019 to October 29, 2020, the date of derailment, no significant defects near the derailment location were noted that would have contributed to the severity or cause of the derailment.

Some measurements in the South Mauriceville switch could be noted by FRA. The track gage at the point of switch was 56-3/4", with 1/16" of cross level. Neither of these measurements were exceptions by FRA standards. Since the POD was heavily destroyed, no meaningful track measurements could be taken.

Conclusion: FRA determined that the cause of the accident was due to T207 -- Broken Rail -- Detail fracture from shelling or head check.

Analysis – Rail Integrity: Continuous Welded Rail (CWR) at MP 750.2, the POD, is located on the Beaumont Subdivision at the South Siding Switch Mauriceville. The rail was manufactured by Bethlehem Steelton in 1993. The rail section is 136 head hardened and was installed in 1993.

FRA interviewed a witness who directly observed the derailment and obtained cellular phone video of the derailment. The video obtained, along with the evidence at the scene, and in agreement with KCS, indicates that a rapidly growing detail fracture (T-207) enhanced by a 36 °F ambient temperature swing created an increase in the tensile longitudinal stresses of the rail, leading to failure.

The growth rate of the detail fracture (DF), which was hidden under the large shell near the rail surface, increased rapidly as indicated in the trailing rail photographs. Consistent vertical loading of the wheel and rail interaction contributed to rail failure.

The Sperry Rail Service report indicates an ultra-sonic rail test was conducted on October 28, 2020, at 2:40 p.m., CDT, over the south siding switch at Mauriceville, on the Beaumont Subdivision. The test was conducted less than 19 hours prior to the train derailment that occurred on October 29, 2020, at approximately 7:25 a.m., CDT.

An examination of the trailing rail indicated a large shell masking a rapid growing DF. The large shell appeared to be present during the ultra-sonic rail test, but the DF was masked by the shell and did not appear to be noticeable in the B-Scan. There was a reflection from the 70-degree transducer, but it may have been a fillet shot or reflection from the shell. Photographs of the tread portion of a wheel that traversed the receiving broken rail indicates an impact mark from the rail head and would be consistent with a broken rail derailment. There were several wheels ahead of the derailment event that have the

same impact marks on the same rail.

The defective rail was in the south switch Mauriceville on the running rail in the guard rail section. Sperry tested this segment of track on October 28, 2020, and noted no defective rail conditions.

Conclusion: FRA determined that a combination of the ambient temperature swing, increased rail longitudinal stress, vertical loading, and the undetectable DF, which occurred due to shelling/corrugation, created conditions for rapid DF growth and rail failure causing the derailment.

Overall Conclusion

FRA's investigators concluded that Signal, Hazardous Materials, Operating Practices, or Motive Power & Equipment, were not the primary or contributing factors in the cause of this accident / incident.

Probable Cause

FRA determined the probable cause to be T207 Broken Rail -- Detail fracture from shelling or head check.