

National Transportation Safety Board
Office of Railroad, Pipeline and Hazardous Materials Investigations
Washington, D.C. 90284

Derailment of FC4230
Conrail Hazardous Materials Train
Paulsboro, New Jersey
November 30, 2012

Mechanical Group Factual Report

DCA 13 MR 002

Accident

NTSB Accident Number: DCA-13-MR-002
Date of Accident: November 30, 2012
Time of Accident: 6:59 a.m. (EDT¹)
Train Identification: FC4230
Railroad Owner: Consolidated Rail Corporation (Conrail)
Train Operator: Conrail
Fatalities: 0
Injuries: Undetermined by Mechanical Group
Location of Accident: Paulsboro, NJ

Mechanical Group Members

National Transportation Safety Board
David E. Watson

Chair

Federal Railroad Administration
Joseph Sanchez

Conrail
Eric Levin

Accident Summary

About 6:59 a.m., November 30, 2012 EDT southbound Conrail freight train FC4230 consisting of two locomotive units and 82 cars derailed seven cars, the 6th through the 12th, near milepost 13.7 on the Penns Grove secondary track in Paulsboro, New Jersey. The cars derailed while traveling over the Paulsboro movable bridge. Four of the derailed cars came to rest in the Mantua Creek waterway. Two cars south of the bridge derailed to the east side of the main track and one car to the north of the bridge derailed to the west of the main track. Conrail reported one of the tank cars released approximately 20,000 gallons of vinyl chloride into the environment. Eyewitnesses reported seeing a vapor cloud rise from the scene immediately following the accident.

Mantua Creek is a stream in the Mantua Township in Gloucester County, New Jersey. It flows northwest for about 18.6 miles to the Delaware River at Paulsboro across from the Philadelphia International Airport. The FAA reports airport operations were unaffected. Mantua Creek is approximately 150 feet wide at the location of the accident.

¹ Eastern daylight time

On the morning of the accident, there were 23 local residents transported to nearby hospitals for evaluation. The initial damage estimates provided by Conrail were \$721,114, which does not include environmental remediation, wreckage clearing or lost lading. The weather at the time of the incident was cloudy skies with 34 degree temperature and calm winds².

Parties to the investigation include: Conrail, the Federal Railroad Administration (FRA), the Brotherhood of Locomotive Engineers and Trainmen (BLET) and the United Transportation Union (UTU). Conrail and the FRA designated representatives to serve on the Safety Board's mechanical investigative group.



Figure 1-Aerial Photo of the Derailment

Train Consist

FC4230 consisted of two locomotive units at the head end configured for multiple unit operation (MU) and 82 freight cars. There were 14 empty cars, 52 cars contained hazardous materials and 16 loaded general freight cars. The train weighed 9,320 tons and was 4,917 feet in length.

Railroad Equipment Involved in the Derailment

The lead locomotive unit, CSXT 8817, of the derailed train was an EMD model SD40-2 built in 1977. This unit was a six-axle / two-truck, 3000 HP diesel-electric locomotive. It is

² Source: NOAA http://www1.ncdc.noaa.gov/pub/orders/72408013739-2012-11_7584466043346dat.html

equipped with a 16645F EMD engine, a medium-speed turbo-diesel engine. The locomotive was equipped with six direct current (DC) traction motors (one fitted to each axle).

The locomotive unit measured approximately 69 ft. (length), by 10 ft. (width), by 16 ft. (height), and weighed (fully loaded with fuel, traction sand, etc.) about 389,000 lbs. A fuel tank, having a capacity of about 4,000 gallons, was located (suspended from the underside of the underframe) between the truck assemblies. Truck centers were 43 feet 6-inches.

The second locomotive unit, CSXT 8830, of the derailed train was an EMD model SD40-2 built in 1977. This unit was a six-axle / two-truck, 3000 HP diesel-electric locomotive. It was equipped with a 16645F EMD engine, a medium-speed turbo-diesel. The locomotive was equipped with six direct current (DC) traction motors (one fitted to each axle).

The locomotive unit measured approximately 69 ft. (length), by 10 ft. (width), by 16 ft. (height), and weighed (fully loaded with fuel, traction sand, etc.) about 389,000 lbs. A fuel tank, having a capacity of about 4,000 gallons, was located (suspended from the underside of the underframe) between the truck assemblies. Truck centers were 43 feet 6-inches.

The derailed cars consisted of one covered hopper, one center beam lumber car and five tank cars. See descriptions in table one below.

Position Number	Reporting Mark	Car Number	Type of Car	Contents	Destroyed	Value ³
6	ECUX	881493	C-Hopper	P-Ethylene	Yes	
7	SGLR	6298	Center beam	Lumber	Yes	
8	UTLX	207938	Tank Car	Ethanol	Yes	\$74,188
9	OCPX	80323	Tank Car	V-Chloride	Yes	\$89,536
10	OCPX	80234	Tank Car	V-Chloride	Yes	\$56,606
11	UTLX	98097	Tank Car	V-Chloride	Yes	\$12,892
12	UTLX	98041	Tank Car	V-Chloride	Yes	\$12,892

Wreckage Description

The locomotives and the first five cars behind the locomotive did not derail. These cars were on the south side of the bridge. The next seven cars, the 6th through the 12th, in the line derailed. Car numbers six and seven were derailed and laying on their sides to the east side of the main. The next car in the line was a tank car (UTLX 207938) loaded with ethanol. This car was still coupled to the A-End of the 7th car (SGLR 6298). See figure 2.

³ This represents a depreciated value.



Figure 2-Photograph of UTLX 207938 Coupled to SGLR 6298

This car was lying on its side on the east side of the main partially submerged on the shoreline of Mantua Creek.

The next car in the line was OCPX 80323, a tank car hauling vinyl chloride. The car was mostly submerged in Mantua Creek on the east side of the bridge. The car was mechanically uncoupled from the 8th and 10th car.

The 10th car (OCPX 80234) was derailed to the east side of the bridge. The tank car was resting on its right side (right side is defined by looking from the B-End) against the 9th car's A-End body bolster. OCPX 80234 sustained a breach at this contact area, releasing part of its product; vinyl chloride. See figure 3. And figure 4. The 13th car was left in place as an anchor and the trailing 70 cars were moved to Pavonia Yard in Camden, NJ.

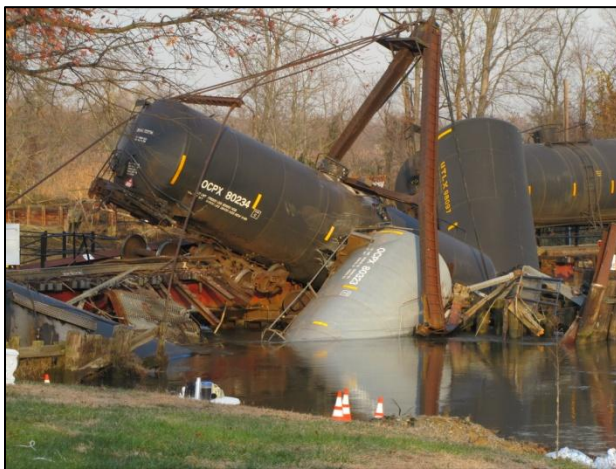


Figure 3-OCPX 80234



Figure 4-OCPX 80234 Torn open by OCPX 80323

The 11th car, UTLX 98097 was derailed off the bridge with the B-End of the car nearly vertical in the water leaning against the bridge. The car did not breach and was not mechanically coupled to the 10th or 12th car. The 12th car, UTLX 98041, was derailed upright, to the west remaining on the bridge.

Equipment Post Accident Inspections

NTSB investigators formed a group of qualified inspectors to evaluate the mechanical condition of the equipment involved in this derailment.

On November 30, 2012, the two locomotives that did not derail were given a Class I mechanical inspection at the Paulsboro Yard in Paulsboro, NJ. The brakes on both units applied and released as designed, leakage rates were within tolerances. Radio functional checks were completed at the yard, no issues were noted. Wheel size on the lead locomotive, CSXT 8817 was 42.25 inches.

On December 1, 2012, the five trailing cars that did not derail from FC4230 were given a Class 1 mechanical inspection at the Paulsboro Yard in Paulsboro, NJ. The brakes on all five cars applied and released as designed, leakage rates were within tolerances.

In all, each wheel on both locomotive units and the first five cars in the train that did not derail were closely inspected. The Conrail representative to the Mechanical Group stated "...we⁴ saw what I can best describe as a smudge or shadow on one of the trailing unit's wheels running perpendicular to the wheel tread...it looked like you could almost wipe it off with your finger. When we inspected the trailing cars we came to see the same type of mark repeating in the cars

⁴ "We" refers to members of the Mechanical Group from the NTSB, FRA and Conrail.

described⁵ but each mark became more pronounced as the distance from the head end increased. All marks were confined to the east side of the equipment...”



Figure 5-Typical impact marks on the flanges of three wheels of the fourth and fifth rail cars

On the 5th car (EQUX 641124) and the 4th car (TTZX 866085) investigators observed freshly made impact marks on the flanges of three wheels on these cars.

- EQUX 641124, wheel R-3
- EQUX 641124, wheel R-1
- TTZX 866085, wheel L-2

The FRA representative to the Mechanical Group said “The gouges were ½” in length. Not very deep.”

⁵ EQUX 641124 and TTZX 86605.



Figure 6-Typical impact marks on the flanges of three wheels of the fourth and fifth rail cars. On December 1, 2012, 70 cars from FC4230 that were not derailed were given a Class 1 mechanical inspection at the Pavonia Yard in Camden, NJ. The brakes on all 70 cars applied and released as designed. The cars were separated in two cuts (60 and 10) and stored on two separate storage tracks in the Pavonia Yard due to the size limits of the yard. The original End of Train Device (EOT) from the train, S/N CSXE X041408 was tested and no exceptions were taken with this equipment.

Derailed Equipment Inspection

On January 30, 2013 the mechanical group convened at Conrail's Pavonia Yard in Camden, New Jersey to inspect the five tank cars that had been derailed, as well as, various components that had been recovered from those cars during the salvage operation. The tank cars inspected were; UTLX 207398, OCPX 80323, OCPX80234, UTLX 98097 and UTLX 98041. The coupler pockets on both ends of all five cars were unremarkable. The draft gears, yokes and draft gear pockets on both ends of all five cars were unremarkable. The body side bearing contact locations displayed normal wear patterns. The body bolsters and outer tank shells exhibited apparent post-derailment deformation.

General component inventory:

- 12 100-ton wheel sets,
- 7 truck bolsters,
- 7 truck side frames,
- 16 ½ brake beams,
- 3 broken coupler heads,
- Brake rigging; top rods, bottom rods, levers,
- 2 air brake control valves,
- Cross-over steps,
- Loose truck springs; inner coils, outer coils,
- Truck side bearing rollers,
- Air brake system reservoirs.



Figure 7 Recovered rail car components.

None of the wheels on any of the 12 sets had any type of flange profile defect. Each wheel set had 100-ton axles and 6 ½ by 12 roller bearings. Several roller bearings were broken but strike marks were evident at each broken location. One axle was bent with back-to-back readings of 50 inches and 57 7/8 inches.



Figure 8 Typical recovered wheel profile.



Figure 9 Recovered bolster, side frame, partial trucks and wheel sets.

The bolster bowls were equipped with hardened steel wear liners. None of the bowls indicated abnormal wear patterns. Every gib, both inner and outer, was well within Association of American Railroads (AAR) tolerance. The bolsters were all standard rotation.



Figure 10 Typical recovered body bolster.

The truck side frames were each properly sized and did not display any cracks or breaks. There was no excessive wear on any of the column wear guides. The spring seats did not display any evidence of spring rotation. There were no abrasion marks on the bottom of any side frame nor were there burn marks on any of the gussets. All friction wear plates were in place and did not have excessively worn contact surfaces or broken securements.

All the springs were within AAR free height requirements. None of the springs indicated heavy compression loading within the coils. There were no broken springs.

There were no obvious pre-accident wear indications on any of the brake beams. Each was designed for composition brake shoes with appropriate rejection lugs.

Documentation Collected

The following documentation was collected on scene as part of this investigation:

Electronic Copies

1. Switch list of the train

2. UMLER data for locomotives CSXT 8817 and CSXT 8830
3. Daily inspection cards for CSXT 8817 and CSXT 8830 (FRA F6180-49A)
4. Inspection and repair records for CSXT 8817 and CSXT 8830
5. Air gauge certification for Pavonia Yard
6. OCPX 80234 drawings
7. Car inspection documents (49 CFR 232 Brake test reports)
8. Latitude and Longitude reports for CSXT 8817 and CSXT 8830
9. Cost data for damaged cars
10. Dragging Equipment data
11. Photographs
12. Waybills for 1st 14-cars

Appendix A

DCA-13-MR-002 Derailment Sketch-Draft

For Official Use Only

Position Number	Reporting Mark	Car Number	Contents
6	ECUX	881493	P-Ethylene
7	SGLR	6298	Lumber
8	UTLX	207938	Alcohols
9	OCPX	80323	V-Chloride
10	OCPX	80234	V-Chloride
11	UTLX	98097	V-Chloride
12	UTLX	98041	V-Chloride
13	OCPX	80305	V-Chloride

