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NATIONAL TRANSPORTATION SAFETY BOARD

Office of Railroad, Pipeline and Hazardous Materials Investigations
Washington, DC

MECHANICAL GROUP FACTUAL REPORT

CSXT Railroad, Derailment with Hazardous Materials Release and Fire

Accident

NTSB Accident Number: DCA17FR011
Date of Accident: August 02, 2017
Time of Accident: 4:54 a.m. (EDT)
Railroad Owner: CSXT
Train Operator: CSXT
Type of Train and No: Q38831 (Mixed Freight/Hazmat)
Crew Members: 1 Engineer, 1 Conductor
Location of Accident: Hyndman, PA

Prepared by: Jim Southworth, Chairman
Mechanical Group



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1 **Accident Summary**

2 For a summary of the accident, refer to the IIC *Accident Summary* report within this
3 docket.



4
5 **Figure 1. Aerial view of accident location. Several houses are seen within the**
6 **photograph. Near the center are several derailed railcars and a fire with smoke**
7 **rising from the site.**

8
9 **Track Description**

10
11 This portion of the CSXT, the Keystone subdivision, consists of 87.1 miles of double
12 main track, and 2.7 miles of single main track between milepost BF 178.6 and milepost BF 268.4
13 with one passing sidings. The subdivision's average daily train count is 30. According to CSX
14 documentation, the 2016 total tonnage figure for the subject track between milepost BF 178.6
15 and milepost BF 268.4 was about 39.2 million gross tons.

16
17 CSXT inspects and maintains the main track on this portion of the Keystone Subdivision
18 to Federal Railroad Administration (FRA) Track Safety Standards (TSS) for Class 3 track, which
19 allows for a maximum operating speed of 40 mph for freight trains and 60 mph for passenger

1 trains. Amtrak operates two passenger rail trains (one east bound and one westbound) over this
2 subdivision 7 days a week.

3 The crossties measured 9-inches by 7-inches by 8-feet 6-inch long, spaced 19.5 inches on
4 center (nominal). The rails were fastened to the crossties using Pandrol plates fastened with one
5 cut spike on the field and gage sides of each rail and two lag screws on the field and gage side of
6 each rail. A Pandrol clip is used on the gage and field sides of each rail. These fasteners are used
7 to maintain gage and alinement of the track as well as restrain longitudinal movement of the
8 continuous welded rail (CWR). The track was supported by granite rock ballast. Track note
9 measurements taken around the derailment revealed an average degree of curvature of 8.375 -
10 degrees with about 3.2-inches of super-elevation in the accident curve. Track notes also revealed
11 that track gage in the full body of the curve was 57-1/2 inches.

12



13

14 **Figure 2. This photograph, facing east and the direction of travel, shows two sets of tracks with the**
15 **accident track and curve on the right side of the photograph.**

16

17 Railroad Equipment

18

19

The eastbound CSX freight train Q38831 consisted of 5 locomotives, and 178 cars.

1 The train included 128 loaded cars and 50 empty cars. The train was 10,612 feet in length
2 and weighed 18,252 trailing tons. There was no distributive power assigned to this train.
3 Three of the lead locomotives were on-line (providing tractive effort) and two were dead-
4 in-tow (moving for repair).

5

6 The locomotives were disconnected (cut) from the remaining train and moved east
7 about 7.5 miles, directly behind the Incident Command Center that was established at the
8 Hyndman Ministry Center. The Mechanical Group conducted an inspection and review of
9 the locomotives at this location on the afternoon of August 2, 2017.

10

11 The locomotives on the eastbound CSX train number Q38831 were all
12 positioned at the front of the train and did not derail. The locomotive consists included:

13

| | | | |
|-------------|------------|------------|---------------------------------|
| 14 CSX 3338 | ET44AC | Built 2015 | Lead controlling locomotive |
| 15 CSX 4040 | EMD SD40-3 | Built 1980 | |
| 16 CSX 8540 | EMD SD50-3 | Built 2012 | |
| 17 CSX 5359 | ES40DC | Built 2006 | Offline - Moving to be repaired |
| 18 CSX 7921 | CW40-8 | Built 1994 | Offline - Moving to be repaired |

19

20

21 The lead locomotive (CSXT 3338) was a six axle, two truck design, 4400
22 horsepower, General Electric model ET44AC. It was built in 2015 and was equipped with
23 CCB II type air brake equipment. This locomotive had its last periodic inspection
24 performed on the June 19, 2017, at Nashville, TN, as recorded on the Form FRA F
25 6180.49A (blue card). The previous required 33-day mechanical calendar day inspection
26 was dated July 17, 2017 and listing Willard, OH as the location where the inspection was
27 performed. The last calendar day inspection recorded was dated August 1, 2017 and
28 performed at New Castle, PA. No defects were noted on the report as part of the
29 inspection.

30

31 The first trailing locomotive (CSXT 4040) was a six axle, two truck design, 3000
32 horsepower Electro-Motive Diesel model SD40-3. It was built in 1980 and was equipped
33 with Wabtec Fastbrake type air brakes. This locomotive had its last periodic inspection

1 performed on June 29, 2017, at Cumberland, MD, as recorded on the Form FRA F
2 6180.49A (blue card). The previous required 33-day mechanical calendar day inspection
3 was dated July 17, 2017 and listing Willard, Ohio as the location where the inspection was
4 performed. The last calendar day inspection recorded was dated August 1, 2017 and was
5 performed at Willard, Ohio. No defects were noted on the report as part of the inspection.
6

7 The second trailing locomotive (CSXT 8540) was a six axle, two truck design,
8 3000 horsepower Electro-Motive Diesel model SD50-3. It was built in 1984 and was
9 equipped with Wabtec Fastbrake type air brakes. This locomotive had its last periodic
10 inspection performed on June 15, 2017, at Nashville, TN, as recorded on the Form FRA
11 F 6180.49A (blue card). The previous required 33-day mechanical calendar day inspection
12 was dated July 30, 2017 and listing Louisville, KY as the location where the inspection
13 was performed. The last calendar day inspection recorded was dated August 1, 2017 and
14 was performed at New Castle, PA. No defects were noted on the report as part of this
15 inspection.
16

17 The third trailing locomotive (CSXT 5359) and fourth trailing locomotive (CSXT
18 7921) were being moved to Cumberland yard dead-in-tow for repairs.
19

20 **Pre-Accident Mechanical Inspection of Cars**

21 CSX Train Symbol Q38831 (Q38831) was assembled and originated at Chicago,
22 Illinois with 136 cars on July 31, 2017. An additional 28 cars were added in Lordstown,
23 OH and 14 were added in New Castle, PA on August 1, 2017; making the Q38831 train
24 consist 178 cars total at the time of the derailment.

25 Records reviewed indicated that the Q38831 was assembled from two previously
26 tested and mechanically inspected blocks of cars. The first block of 74 cars (#1 thru #74)
27 received a Class I Brake Test and mechanical inspection by CSX qualified mechanical
28 department personnel in Chicago, IL on July 31, 2017 with no defects noted. The second
29 block of 62 cars (#75 thru #136) received a Class I Brake Test and mechanical inspection

1 by Belt Railway Company (BRC) qualified mechanical department personnel in Chicago,
2 IL on July 31, 2017 with no defects noted. The assembled 136 cars had an end-of-train
3 device (ETD), CSXE 41811, which was applied, and telemetry tested by CSX
4 transportation department personnel, also in Chicago, IL on July 31, 2017, at 9:40 p.m.

5 When the Q38831 arrived at Lordstown, OH, approximately 390 miles from the
6 originating location, 28 additional cars were added to the front (head end).

7 These 28 cars received a Class I Brake Test and mechanical inspection by the CSX
8 transportation department personnel (Train Crew of Q38831) in Lordstown, OH on
9 August 1, 2017 with no defects noted. Leaving Lordstown, OH, the Q38831 consist had
10 164 cars as indicated by the AEI wayside detector located at the east end of the yard.

11 When the Q38831 arrived at New Castle, PA, approximately 430 miles from the
12 originating location, 14 additional cars were added near the head end of the train (#9 thru
13 #22). These 14 cars received a Class I Brake Test and mechanical inspection by the CSX
14 transportation department personnel (Train Crew of Q38831) in New Castle, PA on
15 August 1, 2017 with no defects noted. Leaving New Castle, PA, the Q38831 consist had
16 178 cars as indicated by the AEI wayside detector located at the east end of the yard.

17 Listed below are the empty and loaded car positions following the locomotives.

18 8 empties
19 2 loads
20 1 empty
21 4 loads
22 27 empties
23 44 loads
24 1 empty
25 4 loads
26 6 empties
27 13 loads
28 1 empty
29 23 loads
30 1 empty
31 8 loads
32 1 empty
33 12 loads
34 2 empties

1 19 loads

2

3 **Mechanical Defective Conditions En-route**

4 As the Q38831 proceeded past the Sand Patch Summit at MP BF 212.2 the
5 engineer stated, and the event recorder confirmed, abnormalities with the train line
6 airbrake pressures at the rear of the train compared to the front of the train; as indicated
7 by the End of Train Device (ETD) to the Head of Train Device (HTD). These observed
8 abnormalities and the approaching descending grade concerned the train crew resulting in
9 the crew's decision to stop Q38831 at MP BF 205.6. The conductor then disembarked the
10 locomotive and proceeded to apply 58 handbrakes to the cars (#1 thru #27 and #34 thru
11 #64) to secure the train from an unintended airbrake release. The handbrakes of cars #28
12 thru #33 were not applied due to their location on the cars. The information regarding
13 which handbrakes were applied was corroborated by the post-accident interview of the
14 conductor.

15

16 After securing the train the conductor made a walking inspection of train Q38831.
17 At car #159 (LW 62114), a bulkhead flat, the conductor found an air leak to the brake pipe
18 train line at the cars' b-end intermediate brake pipe hose. The conductor then returned to
19 the lead locomotive where he and the engineer remained, while waiting for a relief crew,
20 due to Hours of Service (HOS).

21

22 CSX Mechanical Department employees replaced the hose, informed the train
23 crew (relieving crew) of the repair, and remained on-site to provide additional assistance
24 if needed.

25

26 The relief crew, left all 58 handbrakes applied and unsuccessfully tried to pull the
27 train down the hill with the lead locomotive in notch 5. The first 25 handbrakes were
28 released. An airbrake minimum set was applied before the train began moving down the
29 grade. Speed on the move down the grade was between 20 and 30 mph. The engineer
30 controlled the speed of the train by cycling from power braking to full dynamic braking.

1
2 On an eight-degree curve and about a 2 percent descending grade, the trailing truck
3 (right #3 wheel) of the 35th car derailed. The wheel came off in the middle of the full body
4 of this curve about 1.7 miles before reaching the pile up location. The train was in full
5 dynamics and had a minimum brake application with 33 applied handbrakes when the
6 derailment happened.

7
8 After restoring the air to the brake pipe train line, the relief conductor released 25
9 handbrakes leaving 33 applied prior to descending movement of the train eastbound
10 towards Cumberland, MD.

11
12 The 35th cars' #3-wheel set had heavy built up tread on the tread surface and the
13 throat of the flange. The tonnage from the first car in the consist to the 35th car was
14 1,631 tons. There was 16,621 tons trailing the 35th car. The 35th car was an empty high-
15 sided gondola and was in a block of 27 empties.

16
17 The Q38831 had an undesired emergency brake application (UDE) occurring at
18 about 4:54 a.m. (event recorder time) when the lead locomotive was near the grade
19 crossing (Crossing ID: 145072F) at Center St. in downtown Hyndman, PA. The lead
20 locomotive then travelled approximately 500 feet to a complete stop just east (timetable
21 direction) of the grade crossing at Market St (Crossing ID: 145071Y). The UDE was the
22 result of train line brake pipe separation that occurred when 32 cars derailed. Fifteen of
23 the derailed cars contained hazardous materials, breaching several and causing a fire. A
24 one-mile evacuation order was established by the Incident Commander of the emergency
25 response.

26 27 **Determination of POD**

28
29 Mechanical and Track investigation teams determined that the POD (the location where
30 the normal wheel and rail interface was disrupted) was near milepost BF 193.7 on main track
31 No.2. An examination of the POD by investigators was conducted late on the afternoon of

1 August 3, 2017. Evidence that a wheel climbed the high-side of the north rail on main track No.
2 2, while coming out of an 8.375-degree right-hand curve on a descending grade of 1.67 per cent,
3 traveling eastbound was observed. This was followed by an additional wheel climbing within 30
4 feet on the north rail as well. Investigators also photo documented flange and tread marks from
5 the derailed rail car wheels that were found on various track components to include flange marks
6 to the ties inside the gage. The POD was 1.7 miles west of a rail grade crossing (Hogback Road)
7 where additional rail cars departed the tracks.

8
9 Traveling on main track No. 2, the eastbound train traversed a grade ranging from 0.50
10 to 2.12 beginning at milepost BF 210.8 (top of grade) to milepost BF 192.3 (train resting
11 location). From milepost BF 195.2 to the POD at BF 193.7, the train was on a descending
12 grade of between 1.65 and 2.08. At the point of derailment, the train was traversing an 8.375
13 average degree curve, with 3.21 average inches of super-elevation (outer rail of curve elevated
14 above the inner rail of curve). Train speed was 28 mph at the time of the train line emergency
15 brake application.

16
17 Of the train's 18,252 tons, the first 42 cars made up approximately 10% of the
18 train's total tonnage. There was 16369 tons (90% of the train's tonnage) behind the
19 head 42 cars.

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Figure 3. Photograph showing a section of rail with wheel flange departure mark across the rail in curve at the Point of Derailment.

4

5 **Post-Accident Equipment Inspections**

6

Mid-day on August 3, 2017 the derailment site was partially open for investigation, allowing examination of the equipment (cars) that remained on the rails, and the POD. All derailed cars were observed to have their handbrakes applied; except for those where the damage made it impossible to determine. Numerous overheated wheels, some with evidence of built up tread, were identified.

11

12

The 33 cars (position #1 thru #33) east of the general pile-up were initially examined at the derailment site. Car #10 (TILX 261890), a loaded hazardous material tank car, was found with the handbrake partially applied due to fouling the crossover platform when it was last released. There were no other notable findings.

16

17

The 31 cars (position #1 thru #31) east of the derailment were moved to the CSX yard in Cumberland, MD for further testing and inspection.

18

1 The 112 cars (position #67 thru #178) west of the general pile-up were examined
2 at the derailment site. A truck spring was found lying in the gage beneath the trailing end
3 of car #178 (CAN 404841). Minor tie damage and displaced ballast was also observed
4 beneath the cars examined. There were no other notable findings.

5
6 The 111 cars (position #68 thru #178) were moved from the derailment site to the
7 CSX yard in Connellsville, PA for further testing and inspection.

8
9 The evening of August 3, 2017 a Class I Brake Test and Mechanical Inspection
10 was conducted at the CSX yard in Cumberland MD of the leading (east end) 31 cars of
11 train Q38831 that did not derail. Investigators observed 13 defective/non-complying air
12 brake conditions according to 49CFR 232.103(f3). Eleven of cars did not apply brake
13 cylinder pressure or did not maintain brake cylinder pressure after applied. These 11 cars
14 were requested to have Single Car Air Brake Testing performed. On August 9, and
15 August 10, 2017, Single Car Air Brake Testing was performed at the CSX yard in
16 Cumberland, MD to the 11 cars found with non-complying conditions during the initial
17 testing performed on August 3, 2017. All deficiencies were corrected by CSX before the
18 cars were released to CSX.

19
20 On August 4, 2017, a Class I Brake Test and Mechanical Inspection was
21 conducted at the CSX yard in Connellsville, PA to the trailing (west end) 111 cars of
22 Q38831 that did not derail. There were no notable findings.

23
24 During the investigation, restoration and remediation activities (before daylight)
25 on August 4, 2017, Investigators discovered a freight car truck with damage consistent
26 with being derailed prior to the location of the general pile-up. The wheelsets from the
27 truck were also identified. The location where the truck and wheelsets were discovered
28 was approximately 100 feet southwest of the Schellsburg St./Hogback Rd. (Crossing ID:
29 145073M) grade crossing near the bottom (below other damaged/derailed equipment) at

1 the west end of the general pile-up. Investigators secured the truck and its' wheelsets for
2 further review.

3
4 During the afternoon of August 5, 2017 an initial review of the truck and wheelsets
5 was performed. The trucks' side frames were stenciled indicating it was from FWTX
6 620111 (Position #35). The post-derailment location of car FWTX 620111 was
7 approximately 600 feet east of where the truck was discovered. Evidence that the truck
8 was derailed prior to the general pile-up was observed. The other truck from FWTX
9 620111, with its' wheelsets still partially in place on the truck, were found near the east
10 end of the general pile-up and approximately 300 feet from the post-derailment location
11 of car FWTX 620111. The trucks and their wheelsets were relocated for a more in-depth
12 review on site.

13
14 Mid-day on August 6, 2017 an initial review of the trucks from FWTX 620111
15 was conducted. The primary focus of the review was to the truck and wheelsets that were
16 found near the grade crossing. Evidence that this truck derailed prior to the general pile-
17 up was found on the trucks' side frames. The wheelsets were also reviewed. Excessive
18 overheating and tread build-up was observed on one wheelset. Additional damage that
19 indicated that both wheelsets had been off the rail/on the ground prior to the general pile-
20 up was noted. The other truck, car body center plates and car body side bearings were also
21 examined. Photographs, measurements and the conditions observed to the car and
22 components were compiled. Car FWTX 620111 and its' components were requested to
23 be secured at the CSX yard in Cumberland, MD.

24
25 On September 19, and September 20, 2017, an extensive review of car FWTX
26 620111 (position #35) and review of documentation was conducted. The truck and two
27 wheelsets, identified as belonging to car FWTX 620111, found near the grade crossing
28 at the west end of the general pile-up was the primary focus of examination. The
29 indications that the truck had derailed prior to the general pile-up included gouges on the
30 bottom of the side frame (consistent with impact with the rails), damage to the inside

1 vertical surfaces of the side frame (where the wheel made contact) and damage to the
2 tread of the wheels (consistent with contact with the roadbed). This truck was identified
3 to be from the A-end of the car. A review of supporting documentation indicated that the
4 A-end was the leading end (in direction of movement) of car FWTX 620111 in train
5 Q38831 at the time of derailment.

6

7 All the wheels of car FWTX 620111 had indications of overheating. The
8 overheating of the wheels of the #4 and the #2 axles (1st and 3rd axles in direction of
9 movement) were observed with a reddish-brown discoloration on both the front and
10 back of the rim; extending more than four inches into the plate. The wheels of the #4 and
11 the #2 axles were also observed to have extensive built-up tread.

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Figure 3. A close-up view of a wheel tread surface (from a wheel of the 35th cars' #3-wheel set). Heavy metal build-up can be seen on the tread surface and in the throat of the wheel flange.

1 **Intermediate Hose Leakage**

2 During interviews with train crews, the first crew (relieved later for HOS) said that
3 they felt that their train had air problems when they saw an increase in pressure differential
4 at the rear end-of-train device. The crew brought the train to a stop on the grade and
5 proceeded to apply a total of 58 handbrakes to hold the train. The conductor found leakage
6 on the 159th car and called to have a carman to fix the leakage in an intermediate hose.
7 The leaking intermediate hose was replaced by the carman.

8

9 Mechanical investigators inspected the hose that was removed and found no
10 visible signs of kinking. The hose was fitted with a glad hand on one end and a pipe nipple
11 and cap on the other. The hose was then pressurized to identify the location of the leak.
12 The hose leaked at one end just behind the hose clamp and flange fitting. Arrangements
13 were then made with CSX in Cumberland Terminal to attach the hose to the rear of a 67-
14 car freight train prepared and inspected ready for departure. Leakage on the train before
15 attaching the hose at the rear was 2 psi. After attaching and cutting in the leaking hose,
16 the leakage showed an increase of between 1 and 1 ½ psi.

17

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1

2 **Figure 4. A close-up view of the intermediate air brake hose removed from**
3 **car LW 62114 due to leakage. Some deterioration of the hose cover can be**
4 **seen next to the hose assembly fitting.**

5 **End-Of-Train Device**

6 On August 6, 2017, the end-of-train device CSXE 41811 was inspected and
7 appeared to function properly. The last calibration was done on February 16, 2017.

8 On September 6, 2017, the end-of-train device, CSXE 41811, from train Q38831
9 was tested at the manufacturer's (Siemens) facility in Marion KY. The test was witnessed
10 by CSX and FRA. The test results indicated a number of failures. Most notable regarding
11 the derailment, the end-of-train device was leaking air near the connection to the brake
12 pipe hose. NTSB and FRA requested that CSX return the ETD to the CSX yard in
13 Cumberland, MD for additional testing.

14

15 On October 17, 2017, an examination (brake pipe leakage test) of the end-of-train
16 device (CSXE 41811) and defective intermediate brake pipe hose from car LW 62114
17 (position #159) of the Q38831 was conducted under direction and witness of FRA
18 representatives. Simulating Q38831, 147 cars were assembled with four locomotives. The

1 review indicated that adding the ETD and defective brake pipe hose resulted in an
2 additional 2 pounds per square inch/6 cubic feet per minute of brake pipe leakage.

3
4 **Wayside Detector Data**

5
6 A review of the wayside detector that Q38831 passed prior to derailment was
7 conducted. Q38831 passed the Glencoe detector at MP BFF 200.3 on August 2, 2017,
8 about 4:33 a.m. The Glencoe detector is located less than seven miles prior to the POD
9 and monitors axle journal bearings for overheating/failure. No defects were indicated by
10 the Glencoe detector as Q38831 passed through.

11
12 The previous 90 days of wheel impact wayside detector data was requested and
13 reviewed for the first 66 cars of Q38831. The 66 cars include all cars that derailed and
14 any that passed beyond the general pile-up without derailling. The data was reviewed for
15 the cars and they exhibited normal impact readings.

16
17 The previous wheel impact wayside detector that car FWTX 620111 passed over
18 was the Sleepy Creek wayside detector at MP BA 117 on July 29, 2017 at 9:07 a.m. The
19 report indicated that the car was loaded to a weight of 154.68 tons (309,360 lbs.). The
20 highest impact recorded to the car was 51.01 kips (51,010 psi) at the right side #4 wheel.

21
22 **Damages Estimates**

23
24 CSXT reported \$1.8 million in damages for the derailed equipment. CSXT
25 reported \$60,000 damages to the track structure. These damage estimates do not include
26 additional costs associated with environmental remediation efforts, track damage/repair,
27 or costs associated with the evacuation of residents and businesses affected.