Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch

Accident Investigation Report
HQ-2013-26

CSX Transportation (CSX)
Willard, OH
November 26, 2013

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.

U.S. Department of Transportation
Federal Railroad Administration

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File #HQ-2013-26

TRAIN SUMMARY

1. Name of Railroad Operating Train #1	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
CSX Transportation	CSX	000123157

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
CSX Transportation	CSX	000123157
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident	4. Time of Accident/Incident
	11/26/2013	11:03 PM

5. Type of Accident/Incident
Derailment

6. Cars Carrying HAZMAT	7. HAZMAT Cars Damaged/Derailed	8. Cars Releasing HAZMAT	9. People Evacuated	10. Subdivision
15	3	1	703	Willard Terminal

11. Nearest City/Town	12. Milepost *(to nearest tenth)*	13. State Abbr.	14. County
Willard		OH	HURON

15. Temperature (F)	16. Visibility	17. Weather	18. Type of Track
37 °F	Dark	Clear	Yard

19. Track Name/Number	20. FRA Track Class	21. Annual Track Density *(gross tons in millions)*	22. Time Table Direction
East End Lead	Freight Trains-25, Passenger Trains-30		East

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OPERATING TRAIN #1

1. Type of Equipment Consist:	2. Was Equipment Attended?	3. Train Number/Symbol
Freight Train	Yes	NQ352-26

4. Speed (recorded speed, if available) R - Recorded E - Estimated	Code	5. Trailing Tons (gross exluding 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
7 MPH	R	10081		0

6. Type of Territory

Signalization:

Signaled

Method of Operation/Authority for Movement:

Other Than Main Track

Supplemental/Adjunct Codes:

G, N/A

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.)*	GATX 70688	78	yes			
(2) Causing *(if mechanical, cause reported)*	0	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	0	(1) Total in Equipment Consist	67	0	43	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	4	0	0	0	0

12. Equipment Damage This Consist	13. Track, Signal, Way & Structure Damage
68861	5000

14. Primary Cause Code

T207 - Broken Rail - Detail fracture from shelling or head check

15. Contributing Cause Code

Number of Crew Members				Length of Time on Duty	
16. Engineers/Operators	17. Firemen	18. Conductors	19. Brakemen	20. Engineer/Operator	21. Conductor
1	0	1	0	Hrs: 2 Mins: 3	Hrs: 2 Mins: 3

Casualties to:	22. Railroad Employees	23. Train Passengers	24. Others	25. EOT Device?	26. Was EOT Device Properly Armed?
				No	No
Fatal	0	0	0	27. Caboose Occupied by Crew?	
Nonfatal	0	0	0		No

28. Latitude	29. Longitude

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CROSSING INFORMATION

Highway User Involved		Rail Equipment Involved
1. Type		5. Equipment
2. Vehicle Speed *(est. mph at impact)*	3. Direction *(geographical)*	6. Position of Car Unit in Train
4. Position of Involved Highway User		7. Circumstance
8a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? N/A		8b. Was there a hazardous materials release by N/A

8c. State here the name and quantity of the hazardous material released, if any.

9. Type of Crossing Warning	10. Signaled Crossing Warning	11. Roadway Conditions
1. Gates 4. Wig wags 7. Crossbucks 10. Flagged by crew 2. Cantilever FLS 5. Hwy. traffic signals 8. Stop signs 11. Other *(spec. in narr.)* 3. Standard FLS 6. Audible 9. Watchman 12. None N/A		N/A

12. Location of Warning	13. Crossing Warning Interconnected with Highway Signals	14. Crossing Illuminated by Street Lights or Special Lights
N/A	N/A	N/A

15. Highway User's Age	16. Highway User's Gender	17. Highway User Went Behind or in Front of Train and Struck or was Struck by Second Train	18. Highway User

19. Driver Passed Standing Highway Vehicle	20. View of Track Obscured by *(primary obstruction)*

Casualties to:	Killed	Injured	21. Driver was	22. Was Driver in the Vehicle?
23. Highway-Rail Crossing Users			24. Highway Vehicle Property Damage *(est. dollar damage)*	25. Total Number of Vehicle Occupants *(including driver)*

26. Locomotive Auxiliary Lights?	27. Locomotive Auxiliary Lights Operational?
N/A	N/A
28. Locomotive Headlight Illuminated?	29. Locomotive Audible Warning Sounded?
N/A	N/A

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SYNOPSIS

On Tuesday, November 26, 2013, at 11:03 PM, Eastern Standard Time, (EST) CSX Transportation (CSX) east bound train Q352-26 derailed four of their one hundred ten (110) cars as they were pulling out of the CSX Willard Freight Yard in Willard, OH. The derailed cars were in positions seventy-six (76) through seventy-nine (79). Three of the four cars were loaded hazardous materials tank cars, one of the four tank cars was punctured and leaked approximately 13,538 gallons of Styrene Monomer, a Class 3 flammable liquid.

This resulted in an evacuation within a 1/2 mile radius from the site of the incident. An estimated 400 homes with 703 residents were involved in the evacuation. Willard High School was set up as an emergency shelter while crews contained the spill and the site was made safe. The evacuation was lifted on November 30, 2013 at 9:00 PM.

CSX train crew members did not sustain any injuries and assisted the responders with the cars location and contents based upon their train documents.

Tracks in the yard were shut down along with Main # 3 and Main # 2 as per instructions from the emergency responders. The cost of the damages were reported by CSX personnel as $68,861 for equipment damage and $5,000 for damages to track, signal & structural damage. Total damages were $73,861.

On November 28, 2013 at 1:00PM Track # 1 main was opened to train traffic. On December 2, 2013 Track #3 was opened at 5:00AM and Track # 2 main along with yard tracks were opened at 10:30PM. The weather condition at the time of the derailment was dark and 37 degrees Fahrenheit.

FRA concluded the probable cause of this derailment, involving a hazardous materials release, was T-207 Broken Rail - Detail fracture from shelling or head check.

NARRATIVE

Circumstances Prior to the Accident

CSX Train No. Q352-26 originated at Willard, OH and was eastbound with a final destination for this train crew of New Castle, PA. The CSX train crew went on duty at 9:00 PM, on Tuesday November 26, 2013 at Willard, OH. CSX Train Q352-26 was a mixed freight train powered by four locomotives (lead locomotive CSX 6969) followed by CSX 2369, CSX 107, and CSX 9043. The crew consisted on an engineer and a conductor who all had their statutory rest period before reporting to duty.

The crew was instructed to take fifty-five cars off of Track # 16. They reportedly pulled these fifty-five cars out beyond the ladder, but stopped to re-align #16 switch to normal position for an upcoming yard switcher. When the yard job cleared up, Train Q352-26 shoved back into Track # 10 and made the coupling.

The horizontal alignment of the track approaching the accident site on track was slightly descending less than 0.5%. The lead, freight track, and No. 2 main are at or near level (zero) grades. The only curvature on the occupied route was traversing the three size 10 turnouts. The standard curvature for the curved lead of a size 10 turnout is 7 degrees 21 minutes and 24 seconds.

The method of operation is under the control of a yardmaster. Then engineer was at the control of the lead locomotive when this accident occurred at approximately 11:03 pm in an eastern direction. Eastern direction is also timetable direction that will be used thought this report.

The Accident

As the engineer began pulling this train out of Track 10, he was sitting in the engineer's seat on the south side of the lead locomotive. Without any warning, the engineer reported a wheel slip on his instrument panel. After the wheel slip, the engineer applied sand and immediately received the "PSC open" light indicator on his instrument panel with a subsequent loss of air pressure.

The conductor began walking his train and found four cars on the ground in positions seventy-six (76) through seventy-nine (79) and noted one was leaking heavily. The conductor called the engineer with the leaking car number, who reported it to the yardmaster. The conductor then looked back to see if the leaking and derailed tank car was fouling Main #2.

After reviewing the train consists, the conductor and engineer were told to secure the locomotive, shut it down and clear the area. The conductor provided his train documents to the first responders arriving on scene.

No train crew members were hurt as a result of this derailment.

Analysis and Conclusions:

Analysis – Toxicology Testing: Toxicology testing was conducted on the two train crew members of train Q352-26.

Conclusion: Test results were negative for both the conductor and locomotive engineer which concluded that this did not contribute to the cause of this accident.

Analysis – Fatigue: FRA obtained fatigue related information for the ten (10) working days of both of the involved employees prior to the preceding derailment including the ten day work history of each train crew member involved.

Conclusion: FRA concluded that fatigue was not a factor and did not contribute to this accident.

Analysis - Locomotive Engineer Performance: The locomotive consists consisted of four locomotives on Train Q352-26. The lead locomotive was equipped with an event recorder. The information was downloaded by FRA and CSX officials for review.

Conclusion: The engineer operated the train appropriately and reacted in accordance with all FRA regulations and CSX operating and train handling rules and requirements.

Analysis – Conductor Performance: Based on interview statements, the conductor was following his operating rules during his attempt to double his train together. He acted appropriately, professionally and notified the proper personnel immediately upon detection of the derailment. He provided the proper documents upon request to his supervisor and emergency responders upon request.

Conclusion: This conductor's performance of his duties was not a factor in this derailment.

Analysis – Locomotive Inspections & Class I Air Brake Tests: The four locomotive consist (CSXT 6969, CSXT 2369, CSXT 107 & CSXT 9043) for Train Q352-26 had the Locomotive Daily Inspections for CSXT 6969 & CST 2369 performed by CSX Willard Service Center on November 25, 2013 at 6:41 PM and CSXT 107 & CSXT 9043 performed by the CSX Selkirk Service Center on November 25, 2013 at 2:32 PM. Locomotive Inspection and Repair Records (F6180.49A; 3-85) were posted in the cab of each locomotive and the CSX Class I Air Brake Test was satisfactory performed by car inspector forces at the CSX Willard Yard in Willard, OH on November 26, 2013.

During the FRA mechanical investigation, it was discovered, the locomotive consists listed on Work Order Number 325542, dated November 26, 2013 for Train Q35226 was incorrect (CSXT 6969, CSXT 2369, CSXT 107 & CSXT 9043). According to train Q35226 engineer, the trains consist order was CSX 107, CSXT 6969, CSXT 2369 & CSXT 9043. This discrepancy had no bearing on the derailment of Train Q35226.

Conclusion: Required locomotive inspections and Class I brake test were performed in compliance with Federal regulations. They did not contribute to the cause of this accident.

Analysis – Locomotive Safety Devices: The lead locomotive, CSXT 107 was equipped with a head light, auxiliary lights and audible warning devices as required by Federal regulations. The lead locomotive had a functional WABTEC IFCD-PCM-04 event recorder.

Conclusion: The locomotive safety devices were in full compliance with the Federal regulations. The WABTEC event recorder verified speed, throttle positioning and air brakes and indicated that they functioned as intended.

Analysis – Mechanical – FRA Inspection Report: A mechanical inspection was performed after the derailment on the three tank cars and one hopper car.

Conclusion: The FRA inspection of the four (4) derailed freight cars revealed no major disqualifying conditions to the car components such as: roller bearing journals/seals surfaces, roller bearing adapters, axles/wheels, body center plate, truck frame/bolster, coupler/draft gear/coupler carrier, safety appliances and airbrake equipment.

Tank car PROX 40397 trailing PROX 24047 (the leaking tank car) on the pull out had the #3 wheel that was identified by a wheel impact load detector (WILD) with an assigned CSX Level 3 (80t to 90 Kips Opportunistic Window [Mandatory change on shop or repair track]). Consequently, since PROX 40397 was involved in the derailment, CSX Mechanical Car Department shopped the car and performed a bearing inspection on the #1, 2 and 4 wheels and renewed the #3 wheel. This concluded that tank car PROX 40397 was the last trailing car and this tank car did not contribute to the cause of the derailment.

Analysis – Track Inspection
An audit of CSX track inspection records for the Willard Terminal Subdivision was conducted. The audit went back three months from the date of the derailment covering from August 30, 2013, to November 30, 2013. The audit conducted by an FRA track safety inspector on December 13, 2013 with a focus on the area of concern; the East Lead of the East Bound Class at No. 21 Switch. The audit also included the remainder of the lead switches: No. 1 through No. 21. The lead is not the main track and has a maximum authorized speed of 10 mph (FRA class 1 track) with a required frequency inspection of once monthly. In addition to railroad visual track inspection frequency, the records were reviewed to determine if the area of the point of derailment had been problematic.

Conclusion
All required track inspections of the CSX Willard Terminal Subdivision were inspected in accordance with the Federal Track Safety Standards (TSS) for Class 1 track (in compliance with FRA 49 CFR 213.233). Proper remedial action was taken on all noted defects on the CSX electronic track inspection reports. Rail testing for internal defects is not required by the TSS for Class 1 track and therefore no testing was reported.

Analysis – Track
The main and yard tracks on the CSX Willard Terminal operates in an east to west direction as milepost increase. Main track speeds range from 30 to 45 mph while all yard tracks are 10 mph. The derailed train was operating in the east direction on track No. 10; the east bound class lead, the freight track and No. 2 main tracks. At the time of the derailment, while traversing over several turnouts, the train was traversing through three size 10 turnouts. Specifically, one from 10 track to the lead, one on the lead at the point of derailment (21 switch a right hand turnout with 132 RE rail), and one from the freight track to the No. 2 main. The grade on track 10 was slightly descending less than 0.5%. The lead, freight track and No. 2 main are at or near level (zero) grades. The only curvature on the occupied route was traversing the three size 10 turnouts. The standard curvature for the curved lead of a size 10 turnout is 7 degrees, 21 minutes and 24 seconds.

The lead is constructed of 132 RE (weight 132 lbs. per yard length and American Railway Engineering Association cross sectional design) rail and all turnouts. The track structure is composed of 132 RE stick rail, ballasted track with wood crossties, double shoulder tie plates, cut spikes, and rail anchors. No. 21 switch had been replaced within the last 10 years. The lead had been worked replacing some ties and re-surfaced in 2011.

The rail failure consisted of a detail fracture (TDD) originating from a head check or shelly spot on the gage corner of the rail and the subject rail also had several transverse flaws through-out its 39 foot length. The following is the definition of a TDD as presented in FRA's "Track Inspector Rail Defect Reference Manual" published in August 2011:

Detail fracture means a progressive fracture originating at or near the surface of the rail head. These fractures should not be confused with transverse fissures, compound fissures, or other defects, which have internal origins. Detail fractures may originate from shelly spots, head checks, or flaking.

The detail fracture is usually associated with the presence of a longitudinal seam or streak near the running surface on the gage side. Unlike the transverse fissure, no nucleus will be present.

Growth can be normally slow to a size of a 10 or 15-percent cross-section of the rail head. Growth can then become rapid and/or sudden, prior to complete failure. It is not uncommon for more than one detail fracture to develop in an immediate area where the conditions that initiate their development, such as shelling or head checking, are present.

The detail fracture from the head check is a progressive fracture initiating at the gage corner of the rail head and developing transversely in the head. The origin is a head check condition located at the upper gage corner of the rail, normally associated with concentrated loading which cold works the steel. This can also be referred to as a thermal crack. Growth can be very rapid after a size of 5 to 10-percent cross-sectional area of the rail head is reached.

The rail size was 132 RE and the branding information on one side of the web of the rail was: 132 RE BS Lackawanna 1963 111111. The stamping info on the opposite side of the rail: 14234 D 19. The rail wear was approximately 3/8" on the rail head and ¼" on the gage face.

Conclusion:
The cause of the derailment was determined to be a rail failure consisting of a detail fracture in the curved closure rail of the No. 21 switch. The rail and the track were inspected by the FRA track inspector after the derailment and agree that the cause is correctly assigned.

Analysis – Hazardous Materials Tank Cars: An investigation and full scale inspection was
conducted on leaking tank car PROX 24047. This tank car was properly placarded and described on the carriers shipping documents as UN 2055, Styrene Monomer, 3, PG II. This car leaked approximately 13,538 gallons of product.

A closer look of this car found that this car was equipped with a four inch "AZFFER 2236TT" low profile bottom outlet valve with a two inch plug. This type of valve is designed with a skid casting and a shear plane with four 5/8 inch, A307 grade B, low carbon steel bolts. These four bolts attach the bottom outlet nozzle below the shear plane. Another set of four cap screws holds the valve retainer plate to the body of the valve. This type of low profile valve is designed to shear off at the plane by breaking off the four low carbon steel bolts.

The intention design of the shear plane and skid casting is to protect the ball valve assembly from damage in a derailment. This investigation determined that the breach of this car was caused by a piece of broken rail that lodged into the right side frame of the A end truck of this tank car during the initial moments after the rail break. This momentarily stopped the forward motion of the entire truck, which allowed the loaded tank car to continue to move forward. The separated and suspended truck was precisely positioned to allow the truck bolster bowl to shear off the tankers underframe skid plate and expose the bottom safety valve to the same destructive force. This created a gaping hole on the underside of tank car PROX 24047.

This was confirmed by measuring a 3 inch wide dent on top of the B end bolster bowl located on the A-end truck bolster, and a 3 inch dent on the retainer plate that sits above the sheer plane. Please note that the ball of the rail is also 3" wide.

Overall Conclusions

This investigation did not find any human factor, mechanical, nor signal issues that might have contributed to this accident. The train crew operated the locomotive and handled this train in compliance with the applicable Federal rules and the carrier's operating rules. There were no noncomplying issues with the documents describing the hazardous contents of each car in this train and identifying the location of each hazardous materials car in this train.

The train crew responded to emergency personnel with correct train documentation that allowed for efficient response by local emergency personnel.

After a thorough mechanical inspection of the freight cars and the locomotives involved there were no mechanical issues that caused or contributed to this accident.

Probable Cause

FRA concluded the probable cause of this derailment, involving a hazardous materials release, was T-207 Broken Rail - Detail fracture from shelling or head check.