Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch

Accident Investigation Report
HQ-2016-1165

CSX Transportation (CSX)
Chester, PA
October 28, 2016

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

Synopsis

On October 28, 2016, at about 8:22 a.m., EDT, a westbound CSX Transportation (CSX) freight train, Q19326 (striking train), traveling on double main track (Track No. 1), at a recorded speed of 25 mph, collided head-on into a stopped, eastbound CSX freight train, V75327 (struck train), on CSX's Baltimore Division, Philadelphia Subdivision in Chester, Pennsylvania. Chester Township is a small community about 15 miles south of Philadelphia.

The struck train consisted of 3 locomotives; 0 loaded cars; 64 empty, covered-hopper cars; contained no hazardous materials, with a total length of 3,917 feet and 1,992 trailing tons.

The striking train consisted of 1 locomotive; 8 loaded, articulated cars (14 platforms-units); 0 empty cars; contained no hazardous materials, with a total length of 1,075 feet and 683 trailing tons.

As a result of the collision with the striking train, the struck train's lead locomotive (CSXT 4402) leading truck was raised up, above, and off the rail. There were no hazardous materials released, however, Locomotive CSXT 4402 sustained damage to the fuel tank, which resulted in a minor fuel (diesel) leak of unknown quantity, that did not affect any waterways and was contained by first responders. The collision occurred at Milepost (MP) BAK 14.0, 548 feet west of the interlocking at Control Point (CP) East Feltonville.

Train movements on CSX's Philadelphia Subdivision are governed by operating rules and signal indications from a traffic control system.

No evacuations or stay-in-place order was initiated. There was restricted access established by first responders in the immediate area to facilitate the emergency response.

There were two minor injuries associated with the collision. The injured were train crew employees (the Conductor and Engineer) of the struck train. The injured individuals were taken to the hospital for care and later released.

Damage costs were estimated to be $2,275 for track, signal, way and structure, and $125,888 for equipment.

At the time of the collision, it was daylight, clear visibility, with a temperature of approximately 50 °F. This is not a passenger train route.

The collision resulted in several train delays and was PTC-preventable. At the location of the accident, CSX installed PTC hardware to the wayside signal system, but had not yet activated the system.

The Federal Railroad Administration (FRA) investigation determined that the probable cause of the collision was human factor and will be listed in FRA's Factual Railroad Accident Report as train accident cause code H221 – Automatic block or interlocking signal displaying a stop indication - failure to comply – Note: referenced in CSX Operating Rule 1292

The contributing factors identified in FRA's investigation of the collision involve human factor non-compliances and include the following FRA train accident cause codes:

- H222 – Automatic block or interlocking signal displaying other than a stop indication - failure to comply – Note: referenced in CSX Operating Rule 1285.

- H699 – Speed, other – reference CSX Operating Rule 301.2, If the locomotive operator fails to control the train in accordance with authorized speed, other crewmembers must take action to ensure the safety of the train.
- H999 – Other train operation/human factors – reference CSX Operating Rule 503.14, A sterile cab must be established when operating on a signal indication or by a rule that requires approaching the next signal prepared to stop.

U.S. Department of Transportation
Federal Railroad Administration

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File #HQ-2016-1165

TRAIN SUMMARY

1. Name of Railroad Operating Train #1	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
CSX Transportation	CSX	000163900
2. Name of Railroad Operating Train #2	2a. Alphabetic Code	2b. Railroad Accident/Incident No.
CSX Transportation	CSX	000163900

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
CSX Transportation	CSX	000163900
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident	4. Time of Accident/Incident
	10/28/2016	8:22 AM

5. Type of Accident/Incident
Head On Collision

6. Cars Carrying HAZMAT	7. HAZMAT Cars Damaged/Derailed	8. Cars Releasing HAZMAT	9. People Evacuated	10. Subdivision
0	0	0	0	PHILADELPHIA

11. Nearest City/Town	12. Milepost *(to nearest tenth)*	13. State Abbr.	14. County
CHESTER	BAK14	PA	DELAWARE

15. Temperature (F)	16. Visibility	17. Weather	18. Type of Track
50 ˚F	Day	Clear	Main

19. Track Name/Number	20. FRA Track Class	21. Annual Track Density *(gross tons in millions)*	22. Time Table Direction
1 Main	Freight Trains-60, Passenger Trains-80	37.1	West

U.S. Department of Transportation
Federal Railroad Administration

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File #HQ-2016-1165

OPERATING TRAIN #1

1. Type of Equipment Consist:	2. Was Equipment Attended?	3. Train Number/Symbol
Freight Train	Yes	Q19326

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
25 MPH	R	683		0

6. Type of Territory

Signalization:
Signaled

Method of Operation/Authority for Movement:
Signal Indication

Supplemental/Adjunct Codes:
Q

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.)*	CSXT 5000	1	no		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 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	1	0	0	0	0	(1) Total in Equipment Consist	14	0	0	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	0	0	0	0	0

12. Equipment Damage This Consist	13. Track, Signal, Way & Structure Damage
32319	2275

14. Primary Cause Code
H221 - Automatic block or interlocking signal displaying a stop indication - failure to comply.*

15. Contributing Cause Code
H222 - Automatic block or interlocking signal displaying other than a stop indication - failure to comply.*

Number of Crew Members

16. Engineers/Operators	17. Firemen	18. Conductors	19. Brakemen
1	0	1	0

Length of Time on Duty

20. Engineer/Operator	21. Conductor
Hrs: 1 Mins: 25	Hrs: 1 Mins: 25

Casualties to:	22. Railroad Employees	23. Train Passengers	24. Others
Fatal	0	0	0
Nonfatal	0	0	0

25. EOT Device?	26. Was EOT Device Properly Armed?
Yes	Yes

27. Caboose Occupied by Crew? N/A

28. Latitude	29. Longitude
39.847014000	-75.394248000

U.S. Department of Transportation
Federal Railroad Administration

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File #HQ-2016-1165

OPERATING TRAIN #2

1. Type of Equipment Consist:	2. Was Equipment Attended?	3. Train Number/Symbol
Freight Train	Yes	V75327

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
0 MPH	R	1992		0

6. Type of Territory

Signalization:
Signaled

Method of Operation/Authority for Movement:
Signal Indication

Supplemental/Adjunct Codes:
Q

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.)*	CSXT 4402	1	no		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 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	3	0	0	0	0	(1) Total in Equipment Consist	0	0	64	0	0
(2) Total Derailed	1	0	0	0	0	(2) Total Derailed	0	0	0	0	0

12. Equipment Damage This Consist	13. Track, Signal, Way & Structure Damage
93569	0

14. Primary Cause Code
H221 - Automatic block or interlocking signal displaying a stop indication - failure to comply.*

15. Contributing Cause Code
H222 - Automatic block or interlocking signal displaying other than a stop indication - failure to comply.*

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: 4 Mins: 52	Hrs: 4 Mins: 52

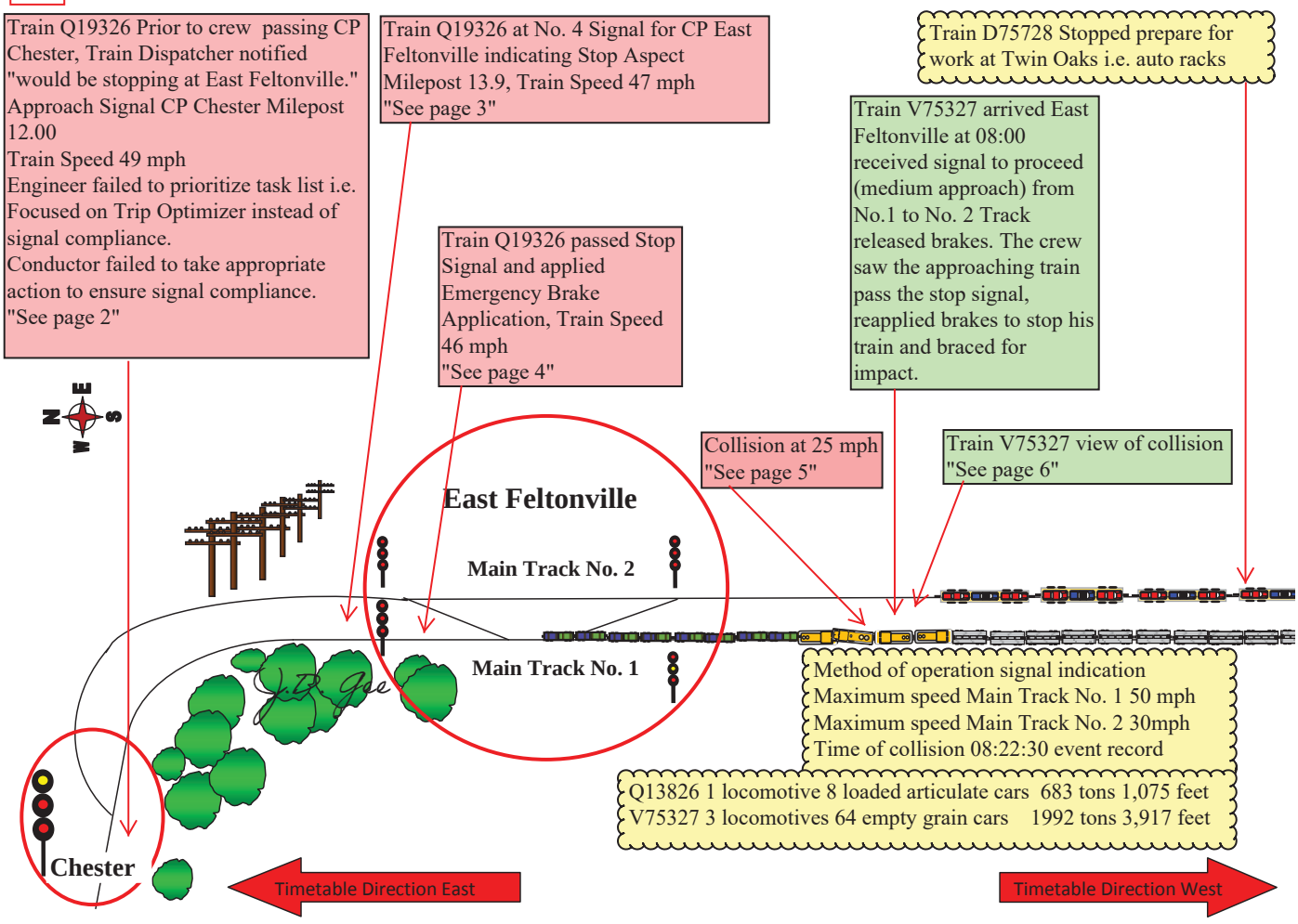
Casualties to:	22. Railroad Employees	23. Train Passengers	24. Others	25. EOT Device?	26. Was EOT Device Properly Armed?
				Yes	Yes
Fatal	0	0	0	27. Caboose Occupied by Crew?	
Nonfatal	2	0	0		N/A

28. Latitude	29. Longitude
39.847014000	-75.394248000

SKETCHES

Sketches

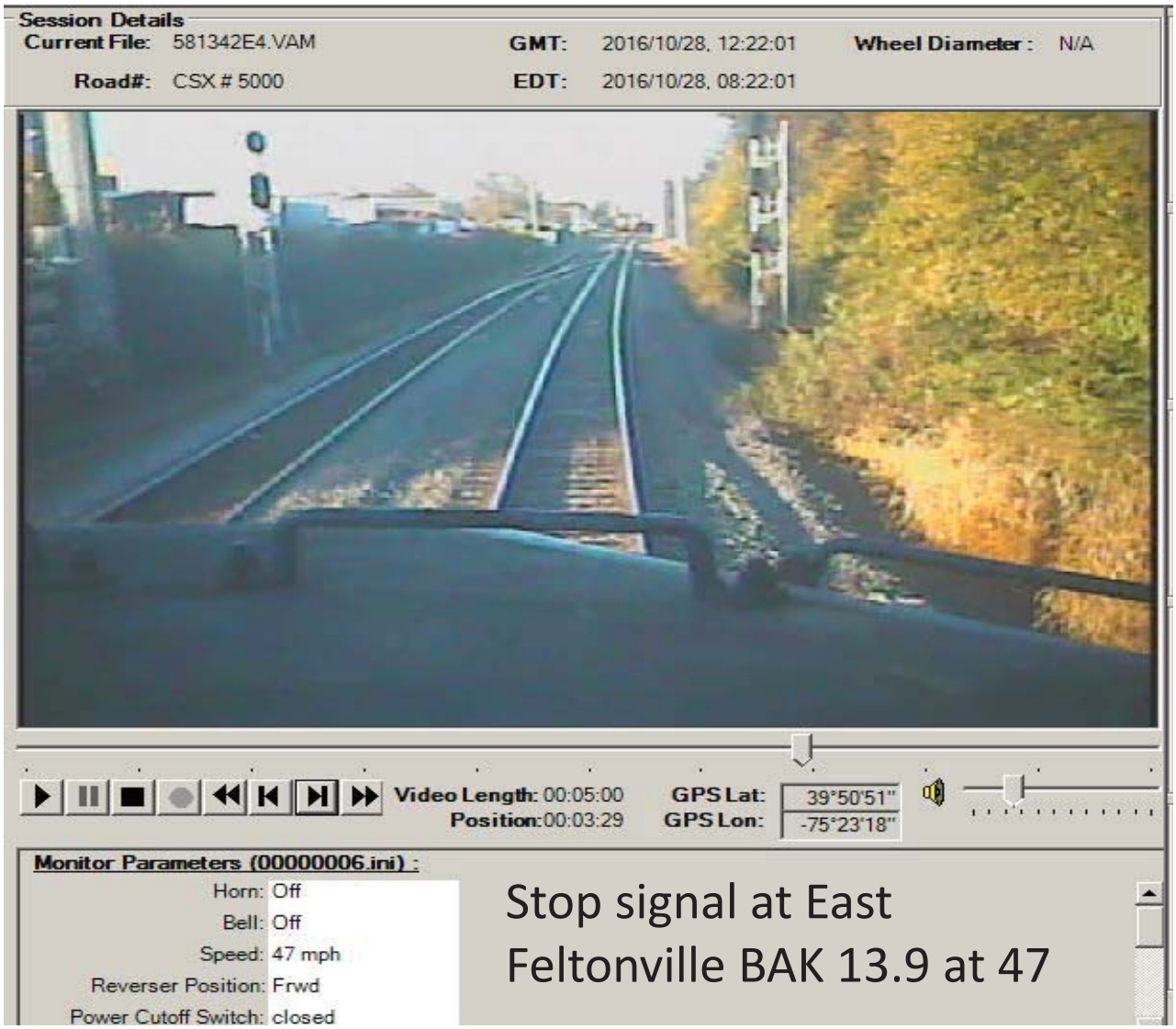
Page 1 HQ 2016-1165



Page 2

Q19326 LDVR

Q19326 LDVR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EDT: 2016/10/28, 08:22:01
Video Length: 00:05:00
Position:00:03:29
GPS Lat: 39°50'51"
GPS Lon: -75°23'18"
Monitor Parameters (00000006.ini) :
Horn: Off
Bell: Off
Speed: 47 mph
Reverser Position: Frwd
Power Cutoff Switch: closed
Stop signal at East Feltonville BAK 13.9 at 47

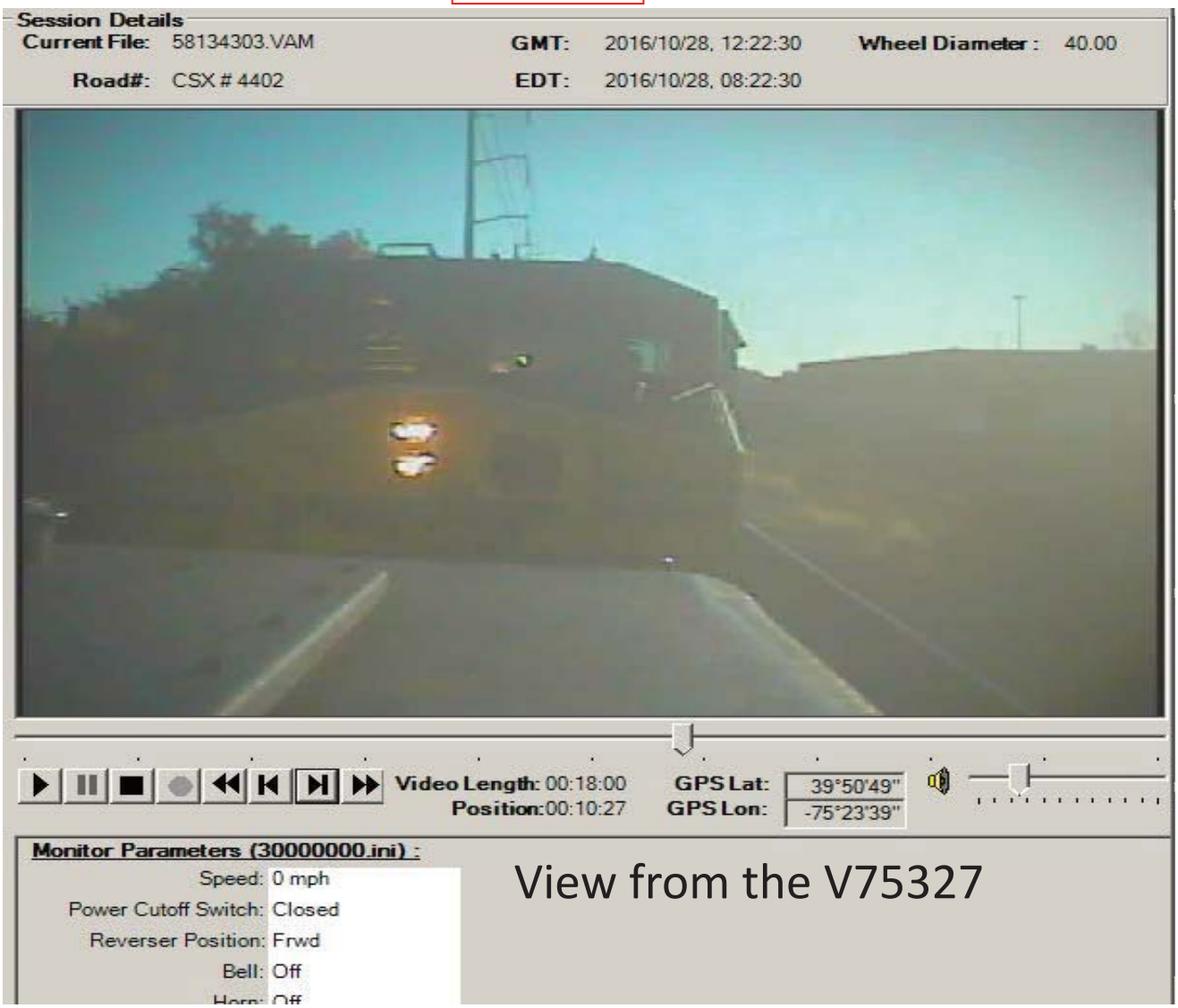
HQ 2016-1165

Q19326 LDVR

HQ 2016-1165

Q19326 LDVR

v75327 LDVR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EDT: 2016/10/28, 08:22:30
Video Length: 00:18:00
Position:00:10:27
GPS Lat: 39°50'49"
GPS Lon: -75°23'39"
Monitor Parameters (30000000.ini) :
Speed: 0 mph
Power Cutoff Switch: Closed
Reverser Position: Frwd
Bell: Off
Horn: Off
View from the V75327

NARRATIVE

Circumstances Prior to the Accident

CSX Transportation (CSX) Train V75327 (struck train), originated in Richmond, Virginia, with a destination of Pavonia, New Jersey. The train crew was comprised of an Engineer and Conductor. Employee training records indicated that the train crew employees were qualified to Federal standards with their medical and training records being up-to-date including passing scores on railroad operating rules and required test exams. All train crew members were certified on the equipment used and the physical characteristics of the territory.

A review of the hours of service (HOS) records indicated that the Engineer and Conductor received their required statutory off-duty rest period and went on duty at CSX's Bayview Yard in Baltimore, Maryland, on October 28, 2016, at 3:30 a.m., EDT. CSX's Bayview Yard was their home terminal.

At the time of the collision, the struck train consisted of 3 locomotives; 0 loaded cars; 64 empty, covered hopper cars; contained no hazardous materials, with a total length of 3,917 feet and 1,992 trailing tons.

CSX Train Q19326 (striking train), originated in Valleyfield, Quebec, Canada, with a final destination of Atlanta, Georgia. The train crew was comprised of an engineer and a conductor. Employee training records indicated that the train crew employees were qualified to Federal standards with their medical and training records being up-to-date, including passing scores on railroad operating rules and test exams. All train crew members were certified on the equipment used and the physical characteristics of the territory.

A review of HOS records indicated that the Engineer and Conductor received their required statutory off-duty rest period and went on-duty at CSX's East Yard, in Philadelphia, Pennsylvania, on October 28, 2016, at 7:00 a.m., EDT. CSX's East Yard was their away-from-home terminal.

At the time of collision, the striking train consisted of 1 locomotive; 8 loaded, articulated cars (14 platform units-hauling intermodal containers); 0 empty cars, contained no hazardous materials, with a total length of 1,075 feet and 683 trailing tons.
The method of operation on CSX's Philadelphia Subdivision is by signal indication in a traffic control system. Timetable direction was east and west with the geographical direction being north and south. Since both timetable direction and geographical direction are not the same, timetable direction will be used throughout this report. The annual volume of rail traffic over the Philadelphia Subdivision, which spans between Philadelphia, and Baltimore, is 37.1 million gross tons.

The site of the collision, Milepost (MP) BAK 14.0, near the interlocking at Control Point (CP) East Feltonville, the tracks are identified from north to south with Main Track No. 1 to the north and Main Track No. 2 to the south. CSX operates and maintains Main Track No. 1 to Federal Railroad Administration

(FRA) Class 4 track requirements with a maximum authorized timetable operating speed restricted to 50 mph for freight trains, and Main Track No. 2 to FRA Class 3 track requirements with a maximum authorized timetable operating speed restricted to 30 mph for freight trains.

At 8:00 a.m., as indicated by the leading controlling locomotive's event recorder, the struck train, traveling on Main Track No. 1, received a stop signal indication at CP East Feltonville at MP BAK 13.9, and responded accordingly. The train crew of the struck train were made aware by the Train Dispatcher that they would be stopping at CP East Feltonville to "meet" (allowing other trains to pass while stopped) several westbound trains and would continue eastbound when the striking train stopped at CP East Feltonville at MP BAK 13.9. While remaining stopped, but preparing to proceed eastbound, the Engineer was sitting at the controls of the locomotive on the south side and the Conductor was sitting on the north side of the lead locomotive. Prior to the collision, the train crew had been on-duty about 4 hours and 52 minutes.

At CSX's Eastside Yard, Philadelphia, after conducting a job safety briefing with the inbound crew regarding the condition of the train, the relieving train crew of the striking train started proceeding westbound on signal indication from CP RG Tower at MP BAK 2.0., at about 7:58 a.m., as indicated by the lead locomotive's event recorder. Soon after departing westbound, at about CP Eastwick, at MP BAK 2.3, the train crew of the striking train began to experience problems with the Trip Optimizer (T.O.). At this time, the Engineer attempted to restore the T.O., while simultaneously, operating the train manually.

After the striking train departed CP RG Tower and before arriving to CP Chester, MP BAK 12.0, the train crew was informed by the Train Dispatcher that they would be "meeting" the struck train at CP East Feltonville, MP BAK 13.9, requiring them to stop and allow the struck train to cross-over from Main Track No. 1 to Main Track No. 2. Then at CP Chester, the striking train's Conductor acknowledged over the radio that they had an approach signal at CP Chester.

The striking train passed the approach signal at CP Chester, MP BAK 12.0, traveling 49 mph, westbound at 8:19:33 a.m., as indicated by the event recorder. As the train approached the location of the collision, the Engineer was sitting at the controls of the locomotive on the north side and the Conductor was sitting in the conductor's seat on the south side of the lead locomotive and had been on-duty for about 1 hour and 25 minutes.

The topography approaching the point of collision from the east consists of an ascending grade of 0.38 percent from MP BAK 13.2 through the point of collision to MP BAK 14.9 where the grade is ascending at 0.1 percent. The alignment of the track is tangent from MP BAK 12.7 to BAK 13.4. From BAK 13.4, there is a 1-degree curve to the right for 2,000 feet and then is tangent about 1,000 feet to the point of collision and continues to BAK 14.6. Both main tracks are constructed with continuous welded rail (CWR) fastened to wood ties. The track centers measure about 13 feet. The view westbound approaching the signal at CP East Feltonville was limited due to the 1-degree curve to the right and dense vegetation on the north side of the track.

The Accident

As the striking train approached CP East Feltonville, MP BAK 13.9, the locomotive event recorder indicated the Engineer had the airbrakes released, the throttle in notch 6 and was traveling at 47 mph. While proceeding westbound through a right-hand curve, the Conductor, and moments later, the Engineer, reported seeing the stop signal indication at CP East Feltonville, MP BAK 13.9. An emergency train brake application was initiated by the Conductor and Engineer in almost simultaneous fashion. The locomotive's event recorder indicated the Conductor initiated an emergency application at 8:22:09 a.m., and about 1 second later, at 8:22:10, the Engineer initiated an emergency application.

At about the same time, the train crew of the struck train observed the striking train approaching from the east.
The striking train began to decelerate due to the emergency train brake application, traveled through the No. 3 crossover switch and collided head-on into the struck train at 8:22:30 a.m., while traveling 25 mph, as indicated by the locomotive's event recorder.

Moments after the collision, the Engineer of the struck train made an emergency call on the radio requesting assistance and the Conductor of the struck train requested assistance using his cell phone by dialing 911 after retrieving it from his bag and turning it on. First responders from the local community, including Chester Township Police, Crozer/Chester Medical Center, participated with the Chester Township Fire Department leading the response.

At the time of the collision, it was daylight, clear visibility, with a temperature of approximately 50 °F.

No evacuations or stay in place order was initiated. There was restricted access established by first responders in the immediate area to facilitate the emergency response.

All train crew members, from both trains, were able to vacate their respective locomotives without assistance and were standing near the site of the collision when first responders arrived. The train crew of the struck train were both transported to the hospital by ambulance for evaluation, treatment, and released later in the day.

Due to the accident, the main track was blocked on the Philadelphia Subdivision at Chester, and all train traffic through the area was rerouted or suspended.

As a result of the collision, Locomotive CSXT 4402, the leading locomotive of the struck train, was lifted off its leading truck and was lodged into the nose of Locomotive CSXT 5000, the leading locomotive of the striking train. In addition, Locomotive CSXT 4402 had the No. 3 axle derail and sustained damage to the fuel tank resulting in a minor diesel fuel leak, of unknown quantity, was contained by first responders, and did not affect any waterways.

The only other reported damage was to the west-end of the No. 3 crossover switch that was run-through by the striking train. The damage consisted of a number of operating rods that needed to be replaced.

The re-railing, track repairs and restoration, was mostly completed during the afternoon of October 28, 2016, and the first CSX freight train passed over the restored collision site later that evening. CSX restored normal operations through the collision site the next morning, October 29, 2016.

Analysis and Conclusions

Analysis - Toxicology Testing: Toxicology testing was performed due to the accident being an impact accident. The crew on the striking train submitted to drug and alcohol testing under the requirements of Title 49 Code of Regulations (CFR) Part 219, Subpart C.

Conclusion: The toxicology test results were negative for the Engineer and Conductor on the striking train. FRA concluded that intoxication was not a contributing factor to the derailment.

Analysis – Fatigue: FRA uses an overall effectiveness rate of 77.5 percent as the baseline for fatigue analysis. At or above this baseline, FRA does not consider fatigue as a probable cause for any employee. Software sleep settings vary according to information obtained from each employee.

FRA obtained fatigue-related information for the 10-day period preceding this accident/incident, including the 10-day work history (on-duty/off-duty cycles) for the train crew of the striking train, the train crew of the struck train, and the Train Dispatcher.

Conclusion: Upon analysis of fatigue information, FRA concluded that fatigue was not probable for the Engineer or the Conductor of the striking train, or for the Conductor of the struck train. FRA also concluded that fatigue was not probable for the Train Dispatcher. However, upon analysis of the fatigue information gathered, FRA concluded that fatigue was probable for the Engineer of the struck train, and the Engineer may have been working at a diminished level of safety (effectiveness) due to mental and/or physical attributes associated with fatigue, but did not contribute to the cause of the collision.

Analysis–Operating Practices (Struck Train Crew Operating Performance): The locomotive was equipped with a speed indicator and event recorder as required by Federal regulations. The relevant event recorder data was downloaded by CSX's Road Foreman of Engines and analyzed by FRA and CSX officials. Post-accident interviews of the train crews were also conducted.
Conclusion: The train crew of the struck train complied with all applicable FRA regulations, railroad operating, and train handling rules and requirements. The post-accident interviews provided additional information as to the circumstances of the accident. FRA concluded train handling of the struck train was not a contributing factor to the collision.

Analysis-Operating Practices (Striking Train Crew Operating Performance): The locomotive was equipped with a speed indicator and event recorder as required by Federal regulations. The relevant

event recorder data was downloaded by CSX's Road Foreman of Engines and was analyzed by FRA and CSX officials.

The striking train's lead locomotive (CSXT 5000) event recorder download indicated the train traveled by the approach signal indication at CP Chester, MP BAK 12.0, at 49 mph, and proceeded in the direction of the stop signal indication at CP East Feltonville, MP BAK 13.9, a distance of about 2 miles, maintaining a speed of no less than 44 mph. While proceeding westbound through a right-hand curve, the Conductor, and moments later, the Engineer, reported seeing the stop signal indication at CP East Feltonville, at MP BAK 13.9. The striking train then traveled past the stop signal at CP East Feltonville, at about 8:22:01 a.m., at a recorded speed of 47 mph. The Conductor initiated an emergency train brake application, and about 1-second later, at 8:22:09 a.m., the Engineer initiated an emergency application at 8:22:10. The striking train then began to decelerate, traveling approximately an additional 1,260 feet, impacting the struck train head on at MP BAK, 14.0 at recorded speed of 25 mph.

Post-accident interviews of the train crews were conducted and revealed additional information. The Engineer and Conductor of the striking train reported that shortly after exiting Eastside Yard westbound, at about CP Eastwick, MP BAK 2.3, began to experience problems with the T.O. The Conductor indicated in the interview that he assumed that the Engineer understood that the train would be stopping at East Feltonville, based on the information received from the Train Dispatcher, via radio.

Background (CSX Trip Optimizer):

The T.O. is a technology based, computer controlled, "cruise control/auto pilot system" on-board the locomotive that communicates wirelessly with a computer located at a fixed location. It is designed to increase fuel efficiency, reduce emissions, and improve on time performance of trains. To initialize the system, the locomotive or train must be stopped. Specific data regarding the train consist, route, and restrictions must be entered. After the data is entered on-board the locomotive, the T.O. transfers the information to the computer located at the fixed location and then a specific "trip plan" is sent back to the locomotive. When the T.O. is engaged by the Engineer, the "trip plan" will be utilized to maintain the locomotive's speed, by controlling the throttle and dynamic braking, but not the air brake functions, to most efficiently transverse the route. The initialization process normally takes several minutes. Time varies due to the reliability of the wireless connection. Some en route failures can be reset while the locomotive is moving, but often it will require the locomotive or train to stop.

CSX requires use of the T.O. when the territory and the locomotives are equipped and the Engineer has received the required training to operate the system. There are some exceptions due to en route failures and safety issues, but these exceptions are often required to be documented, and provided to railroad transportation management for review.

The interviews with the train crew members of the striking train regarding the failure of the T.O. indicated that the Engineer attempted to restore the system while the train was moving.

The Engineer stated in his interview that he believed his fixation on the T.O. led him to misunderstand the location where they would stop at CP East Feltonville to meet the struck train, and misidentify the approach signal indication at CP Chester as a clear signal indication.

The Conductor reported, and the Engineer confirmed, that the Engineer was reviewing train documents and still attempting to restore the T.O. for more than 10 minutes prior to passing over the approach signal indication at CP Chester.

The Engineer reported that he was trying to restore the T.O. while moving to avoid delaying his and other trains around him. He reported, that if he stopped, it was likely to take up to 5 minutes to re-initialize the system. The 5 minutes does not include the time it would take to stop, restore movement of his train, or the cumulative effects to other train movements.

While nearing CP Chester, the striking train's Conductor reported seeing the approach signal indication, and made the required acknowledgements in the locomotive cab to the Engineer, and over the radio. However, upon review of these actions, he questioned if the Engineer clearly understood that the signal indication at CP Chester was an approach and that they would be stopping at CP East Feltonville.

The Conductor also reported that although he did not use his personal cell phone, he failed to shut it off, leaving it on vibrate, when he placed it out of sight in his grip (personal bag). This is not compliant with Federal regulation, Title 49 CFR Section 220.305, *Use of personal electronic devices*, which reads in part "a railroad operating employee must have each personal electronic device turned off… (a) when on a moving train." In addition, CSX Operating Rule 1001.1, Use of Personal Electronic and Electrical Devices, reads, in part, "power off and store all personal electronic…when: (a) Train or locomotive is moving."
The Conductor of the struck train was quoted as saying to the Engineer, "It looks like it is coming in hot," and in the same moment the Engineer of the struck train said to the Conductor, "They ran the signal."

Conclusion: The striking train traveled west by the approach signal indication at CP Chester, MP BAK 12.0 and proceeded in the direction of the stop signal indication at CP East Feltonville, MP BAK 13.9, a distance of about 2 miles. During this time, the Engineer was attempting to restore the T.O., comparing the data on the Locomotive Display Screen with printed train operating documents. Both the Engineer and Conductor failed to establish and maintain an environment where their attention and conversation was restricted exclusively to the actions governing the safe movement of equipment regarding an approach signal indication. These actions by the Engineer and Conductor failed to comply with CSX Operating Rule 503.14.

As the striking train traveled by the approach signal indication at CP Chester, MP BAK 12.0 and proceeded in the direction of the stop indication at CP East Feltonville, MP BAK 13.9, the striking train maintained a speed of no less than 44 mph as indicated by the lead locomotive's (CSXT 5000) event

recorder download. The Engineer failed to slow the striking train and the Conductor failed to take action to ensure that the train was slowed to medium speed (less than 30 mph). These actions by the Engineer and Conductor failed to comply with CSX Operating Rules 1285 and 301.2(b).

The striking train traveled past the stop signal indication at CP East Feltonville, MP BAK 13.9. This action by the Engineer and Conductor failed to comply with CSX Operating Rule 1292.

FRA concluded that the Conductor of the striking train failed to comply with CSX Operating Rule 1000.2(b), but this action was not a contributing factor in the collision.

FRA concluded that the human factor failures of the train crew of the striking train to comply with CSX Operating Rules 1292, 1285, 301.2(b), and 503.14 were contributing factors in the collision.

Analysis –Mechanical:

Train Consists

The striking train originated at Valleyfield, Quebec, with a final destination of Atlanta. The striking train consisted of 1 lead locomotive; 8 loaded, articulated cars (14 platforms units-hauling intermodal containers) containing mixed freight. Total length was 1,075 feet and 683 tons. The lead locomotive, CSXT 5000, was a General Electric model CW 46AH six-axle, 4400 horsepower, manufactured in 2000. It was equipped with CCB2 type air brake equipment and had its previous periodic inspection (184 days), as recorded on Form FRA F6180.49A - Blue Card, as completed on October 27, 2016, at CSX Selkirk, New York. The previous Locomotive Calendar Day Inspection (LCDI) was completed on October 27, 2016, at Selkirk, with no defective conditions noted.

The striking train received a Class I brake test/pre-departure inspection on October 27, 2016, at Selkirk, with no mechanical defects noted.

The struck train originated in Richmond, with a final destination of Pavonia. The struck train consisted of 3 locomotives and 64 empty freight car hoppers that last contained grain. Two of the Locomotives CSXT 4402 and CSXT 4058 were on-line and being used for power. The third Locomotive CSXT 7694, was off-line/dead-in-tow and not being utilized for power.
The train originated in Richmond, on October 27, 2016, and had a proper Class I brake test performed. The Engineer completed a LCDI on the two locomotives. The third was an off-line locomotive and did not have a LCDI as required. The locomotive was dead-in-tow, but was not tagged noncompliant, as required in Title 49 CFR § 229.9. The train consisted of 3 locomotives and 64 empty cars.

Post-Accident/Collision Inspection: The striking train's lead locomotive (CSXT 5000) with the F-end (front end short hood) leading, struck the F-end of CSXT 4402 lifting the locomotive (4402 - 4 axle unit) up and off of the lead truck and caused the lead truck and the No. 3 axle to derail.

A detailed FRA mechanical inspection was performed on the striking train, at the scene. No defective conditions were found. The emergency train brake application resulted in all brake shoes in firm contact with the tread surface of the wheels. Upon inspecting Locomotive CSXT 5000, it was observed that the Engineer's automatic brake handle was located in the emergency position. The Conductor's emergency valve was also in the emergency application position. Locomotive CSXT 5000 received major damage to the front-end, plow, coupler, cab area. There was no intrusion to the interior or occupied area of the cab.

The struck train was also inspected by FRA and CSX's Carmen and no mechanical defects were found. The train had a full-service brake application at the time of collision and was stopped at the time of the collision. This information was confirmed by the locomotive's event recorder downloaded data. The Locomotive CSXT 4402 had extensive damage to the front-end, plow, coupler, coupler pocket, and lead truck. The locomotive was lifted approximately 3 feet up and off the truck. The front wheel and axle truck assembly struck the front left side of the fuel tank causing a small diesel fuel leak that was contained by the fire company. Minimal fuel spilled on the ground and the fuel tank was pumped out by a CSX contractor. FRA observed the re-railing operation and CSX moved the two damaged locomotives to a nearby siding for repairs.

The locomotive cab compartments of the lead locomotives of the colliding trains demonstrated survivable space after the collision. As part of the on-site field inspection, no exceptions were noted on the locomotives regarding the requirements of Title 49 Part 229, Subpart D, Locomotive Crashworthiness Design Requirements and other crashworthiness requirements, including Title 49 CFR Part 229, Appendix E, Performance Criteria for Locomotive Crashworthiness.

A variety of mechanical records were requested and reviewed as part of the investigation. FRA noted an exception for the failure to identify Locomotive CSXT 7694 as non-complying, with a tag, as required by Title 49 CFR § 229.9(a)(3).

Conclusion: After completing the investigation, including comprehensive equipment inspections and available documentation review, FRA concluded that there were no mechanical conditions found to be the cause or contributing factors in this collision.

Analysis - Signal and Train Control: CSX's Signal Manager, for the Philadelphia Subdivision, was contacted to provide copies of all test reports and signal event recorder downloaded data for CP East Feltonville, CP West Feltonville, and CP Chester, as well as radio communications between the train crew and the Train Dispatcher.

A review of the signal event recorder data for CP East Feltonville showed the Train Dispatcher had lined the route at CP East Feltonville for the struck train. The route was lined from Main Track No. 1 to Main Track No. 2 over the No. 1 crossover switch (normal) and the No. 3 crossover switch (reverse) with the No. 2 eastbound signal control to display a medium approach signal indication. The No. 4 westbound signal on No. 1 track displayed a stop signal indication.

Conclusion: After a review of the event recorder data, signal test reports and interview information, FRA concluded that the signal and train control system was not the cause or a contributing factor in this collision. However, the accident was PTC-preventable.

Analysis –Track: FRA conducted a walking inspection of damage to the track following the collision. The point of collision was 548 feet west of the eastward home signal at CP East Feltonville at MP BAK 13.9 on Main Track No. 1. The inspection revealed that the westbound striking train, on Main Track No. 1, failed to stop at the No. 4W home signal at CP East Feltonville displaying a stop signal indication, running through No. 3 switch lined in reverse and collided head on with the struck train.
Approaching the point of collision from the east, there is an ascending grade of 0.38-percent from MP BAK -13.2 through the accident site to MP BAK 14.9 where the grade is ascending at 0.1-percent. The alignment of the track approaching the accident site from the east is tangent from MP BAK 12.7 to MP BAK 13.4. From MP BAK 13.4, there is a 1-degree curve to the right for 2,000 feet and then a tangent about 1,000 feet to the point of collision and beyond to MP BAK -14.6. Both main tracks are constructed with CWR fastened to wood ties. The track centers measured about 13 feet. The view westbound approaching the signal at CP East Feltonville was limited due to the 1-degree turn to the right and dense vegetation on the north side of the track.
CSX records indicate that they visually inspect the track twice weekly, as required by Federal Track Safety Standards. The last visual inspection occurred on October 23, 2016. The prior inspection of the switches at East Feltonville occurred on October 26, 2016. A review of the track and switch records determined that CSX complied with the required inspection frequency. Also, the inspection records were reflective of the track and switch conditions in the area of East Feltonville, in which no defects were noted by FRA or CSX's inspector.

CSX conducted a track geometry car test over the Philadelphia Subdivision on October 20, 2016. CSX's geometry car found no defects in the derailment area for the October 20 test. CSX's frequency for internal rail inspection exceeds FRA's requirement. The last internal rail inspection for defects was on September 16, 2016, and no internal rail defects were detected near East Feltonville.

Conclusion: FRA found no indications of any rail or track defects that would be a cause or contributing factor in this collision.

Overall Conclusions

Based on a close examination, the investigation found no mechanical, track, or signal issues that were contributing factors to the cause of the accident.

Probable Cause and Contributing Factors

FRA's investigation determined that the probable cause of the collision was human factor train accident cause code H221 – Automatic block or interlocking signal displaying a stop indication - failure to comply.

Note: referenced in CSX Operating Rule 1292.

The contributing factors identified in FRA's investigation of the collision involve human factor non-compliances and include the following FRA train accident cause codes:

- H222 – Automatic block or interlocking signal displaying other than a stop indication - failure to comply. Note: referenced in CSX Operating Rule 1285.
- H699 – Speed, other – reference CSX Operating Rule 301.2 - If the locomotive operator fails to control the train in accordance with authorized speed, other crewmembers must take action to ensure the safety of the train.
- H999 – Other train operation/human factors – reference CSX Operating Rule 503.14 - A sterile cab must be established when operating on a signal indication or by a rule that requires approaching the next signal prepared to stop.