GROUP	2
EXHIBIT	
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Agency / Organization

National Transportation Safety Board

Title

NTSB Operations Factual Report

National Transportation Safety Board

DCA13MR002
Derailment/Hazmat Release
Conrail (Shared Assets)
Paulsboro, New Jersey
November 30, 2012

Operations Factual

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Synopsis

On Friday, November 30, 2012, about 6:59 a.m., eastern standard time, southbound Consolidated Rail Corporation (Conrail) freight train FC4230 consisting of two locomotives and 82 cars derailed seven cars, the 6th through the 12th, near milepost (MP) 13.7 on the Conrail Penns Grove Secondary track in Paulsboro, New Jersey. The derailment occurred as the train traveled over the Paulsboro moveable bridge.

Four tank cars that derailed on the bridge came to rest with portions of the cars in Mantua Creek. Three of the derailed tank cars that entered the creek contained vinyl chloride, and one contained ethanol. One of the tank cars was breached during the derailment and 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. The initial damage estimates are $450,654, which does not include response and remediation costs.

On the morning of the accident, 23 local residents were treated for possible vinyl chloride exposure at nearby hospitals and released. The conductor of the train and numerous emergency responders were also tested for vinyl chloride exposure.

Mantua Creek is a navigable waterway in Gloucester County, New Jersey, and is about 150 feet wide at the location of the derailment. It flows northwest for about 18.6 miles to the Delaware River at Paulsboro across from the Philadelphia International Airport. The FAA

reported that airport operations were unaffected. The weather at the time of the incident was cloudy skies with 34 degree temperature and calm winds.[1]

Parties to the investigation include the Federal Railroad Administration, Conrail, Trinity Tank Car, the Brotherhood of Locomotive Engineers and Trainmen, United Transportation Union.

The Accident

The engineer and conductor of the FC4230 (CSXT 8817[2]) went on duty at 3:00 a.m. at Pavonia Yard near Camden, New Jersey. They assembled their train from three tracks and performed an air test on the entire train. After they departed Pavonia Yard, they requested and received a Form D authority from the train dispatcher so that they would be able to operate in the non-signaled territory that started at CP Woodbury (MP 9.0) to Deep (MP 30.0) on the Penns Grove Secondary. Their first stop was for the red (stop) signal at the Paulsboro Moveable Bridge (MP 13.7) after passing the yellow (approach restricting) signal near MP 12.0.

According to the engineer, after stopping for the red signal, he attempted to code the bridge using his radio keypad to clear the signal. Meanwhile, the conductor was examining the bridge from the ground. The conductor returned to the locomotive cab. The signal had remained red. The engineer thought that if he moved the train forward it may help clear the signal if, by chance, the train had not yet occupied the approach circuit. He then attempted to code the bridge with the keypad several more times. Finally, the engineer called the train dispatcher on the radio and asked for permission to go by the red signal at the Paulsboro Moveable Bridge because it had not cleared. Following is the conversation captured from the recorded radio transmissions it starts with the engineer using the radio keypad to operate the bridge:

6:49:40 – 6:49:55	Tone recorded: Keypad tones – beep beep beep
	Bridge: "Conrail Paulsboro New Jersey Moveable Bridge Closing, Out"
6:54:00 – 6:54:21	Tone recorded: Keypad tones – beep beep beep, keypad tones – beep beep beep
6:55:08 – 6:55:16	Tone recorded: Keypad tones – beep beep beep
6:55:49 – 6:55:57	Tone recorded: Keypad tones – beep beep beep
6:56:09 – 6:57:35	Engineer (to dispatcher): "…the bridge was closed we got a stop signal displayed the conductor walked it we hit the code prompt a few times to see if it would pop up clear but it had not."
	Dispatcher: "Is the bridge lined locked for your movement there?"
	Bridge: "Conrail Paulsboro New Jersey Moveable Bridge Failed to Operate, Out"

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

[2] Conrail uses the engine number to designate the train for operational communications; i.e. NORAC Movement Permit Form D, Radio Transmissions, etc.

> Engineer: "Yeah, it's giving us a failed to operate but it is lined and locked, the conductor walked it, showing us a stop signal."
>
> Dispatcher: "Okay, CA11[3] CSXT 8817, permission by the stop signal at the Paulsboro moveable bridge single to single south direction."
>
> Engineer: "CSXT 8817 has permission by the stop signal at the Paulsboro moveable bridge single to single track Penns Grove south."

Once the train had cleared the bridge by approximately two locomotives and seven cars the brakes applied with an emergency application. The engineer stated that he thought they were moving 4 to 5 mph[4] when this occurred. He then looked in the side mirrors and could see the train derailing into the Mantua waterway off the bridge.

The engineer announced "Emergency" three times on the radio. He then started conversing with the train dispatcher and explaining that his train had derailed at the bridge and cars were down in the water way. He also said the bridge appeared to be down. Then the engineer explained that there was a white fog escaping from the derailed cars and that the conductor and he were going to leave the locomotive and move to a safer location.

Seeing school grounds in the vicinity and easy public access to the train derailment by the grade crossing near the bridge, the crew decided to protect the public from entering the area. The engineer went one direction perpendicular to tracks and the conductor went the opposite direction into the local neighborhood to stop anybody heading toward the undetermined white fog.

During a postaccident interview the engineer summed it up with the following:

> The conductor gathered up all of his paperwork. He had all the dangerous paperwork. I took the dangerous paperwork that I have here -- it shows the engine consist -- and we ran in opposite directions, because there's two schools right there and I didn't want anybody with their cars coming up towards that vapor trail because I wasn't sure exactly how dangerous the chemicals or the fumes were, but I knew they were dangerous enough that I had to keep people away. So we turned cars around at that scene until the police came and the police got on the scene and they told us, "Listen, you've got to go back and talk to my chief. He wants that train out of here. He wants those engines out of here." So the conductor went back, threw a quick handbrake on the first car. I gave him a tap on the pin, and we took the engines back to Paulsboro Yard office. And in the interim there, the trainmaster came and he received all the documents from the conductor, what we were carrying, where the dangerous were positioned in the train.

[3] Conrail employees sometimes unofficially refer to the accident train as the CA11.
[4] Event recorder data showed that the train had reached 7 mph when the brakes applied in emergency.

The conductor had the train consist with the hazardous materials information concerning the derailed cars. During his postaccident interview, he explained the information he gave to the law enforcement and his railroad supervisor[5] with the following:

> In the meantime, the police arrives. The police officer takes my name. I tell him -- he asks me what's in the cars. I tell him I'm worried about two cars because I consider first two dangerous. I give him the UN codes. At that time Gary [railroad supervisor] shows up. I hand him the paperwork, and the police officer says if we can cut the engines away. I tied two brakes on the cars, got on the engine and we cut away and I tell Mark just take to the Paulsboro Yard Office, we'll go from there.

At this time the engineer and conductor took the locomotives to the Paulsboro Yard (MP 14.3). Here they were later met by a Conrail supervisor who took the crew to a local medical facility to perform the FRA postaccident toxicological testing.

The Investigation

Bridge Operations Description

According to the *Train Dispatcher's Manual of Instructions and Guidelines* (See Appendix C) the Paulsboro Moveable Bridge was normally open for water traffic from March 2nd to December 1st each year. Although some years, if the weather was warm enough the bridge may stay open after December 1st and if the winter is warmer than normal, there may be a request to open before March 2nd.

The information about the seasonal operation of the bridge was provided to the operating crews in the South New Jersey Dispatcher, Daily Bulletin Number 9-529, Thursday November 29th, 2012, effective 6:01 p.m. and read as follows:

> H. PENNSGROVE Secondary
>
> 1. MP 13.70 (PAULSBORO MOVABLE BRIDGE)**IN REMOTE**[6]
>
> THE BRIDGE IS OPEN FOR THE SEASON CREWS ARE TO OPERATE THE BRIDGE PER TIMETABLE INSTRUCTIONS.

Prior to reaching the bridge from either direction was a permanent yellow (approach restricting) signal. When the bridge was open, the signal protecting movement over the bridge displayed a red (stop) aspect. In order to close the bridge for a train movement, the engineer would stop the train within 100 feet[7] of the red signal in order to occupy a track circuit associated with the signal. After stopping the engineer would enter a key code into the locomotive radio and transmit. A device on the bridge receives the request transmitted from the locomotive radio and closes the bridge. Once the bridge is closed and in proper position the signal should change to a

[5] See Appendix D. **COOPERATING WITH LOCAL EMERGENCY RESPONDERS.**

[6] This meant that the crews would use their radio keypads to "remotely" operate the bridge and give the radio command to close.

[7] The track had a 100 foot approach circuit prior to reaching the signal that had to be occupied before the bridge mechanism would respond to the radio code sent by the engineer using the keypad on the locomotive radio.

green (proceed) aspect and then the train could proceed. The timetable[8] specified the instructions for operating the bridge. (See Appendix A)

During the winter months when the bridge was closed for water traffic, the trains would receive a yellow aspect (as mentioned this signal never changes) prior to reaching the bridge and a green (proceed) signal at the bridge controlling the movement over the Paulsboro Moveable Bridge.

Under either circumstance above when the signal fails to clear and remains red the train crew must contact the train dispatcher. The NORAC rule book[9] contained the instructions to follow when the signal would not clear and read as follows:

> **241. Passing a Stop Signal**
>
> To pass a Stop Signal, a train must have verbal permission of the Dispatcher (or Operator when authorized by the Dispatcher). Permission must not be given or accepted until the train has stopped at the signal. A member of the crew must contact the Dispatcher or Operator and follow his instructions.
>
> **…d. Stopped at a Signal Protecting Movable Bridge**
>
> Under the following conditions, a qualified employee must determine that the rails are properly lined and the bridge is safe for movement before verbal permission is given to pass the signal:
>
> 1. When the signal cannot be displayed for the first movement over a bridge after the bridge has been closed, regardless of bridge lock indications.
>
> or
>
> 2. At any time a bridge unlock indication is received.

Crew of the Accident Train

The engineer and conductor of the accident train were interviewed postaccident. A portion of the interview focused on the procedures the crew used when stopped for the red signal and the inspection of the bridge. At some point the engineer was asked if he thought it odd that when they had arrived at the bridge that the bridge was closed rather than the default position of open. (The bridge is only open during specific months but is closed for the season on December 1st.) The engineer said that he thought maybe they had simply started the "closed" season a day early.

Following is a portion of the interview when the engineer was asked specifics about the bridge inspection:

> Engineer: The conductor had left the engine to inspect the bridge to make sure that the bridge was locked up, and when he came back up, he said the bridge is lined and locked.

[8] Conrail Timetable No. 9, effective June 20, 2011, 6:01 p.m., Eastern Standard Time, Page 99.

[9] NORAC rule book, 10th edition, and effective November 6, 2011, Rule **241. Passing a Stop Signal**, page 73 – 74. (for the entire rule see Appendix F)

Question: Okay. So when the conductor goes down there, what is he looking for?

Engineer: A. There's -- on the north side and the south side of that bridge, either side of the rail has a splice bar that comes over. It's like a faded orange color, and when that comes over, it presses into the rail itself locking everything into place.

Question: So you can definitely tell when it's locked in?

Engineer: You should, yes.

Later in the interview the engineer gave the following detailed description of the locking devices:

Question: How would the conductor or anybody know that the bridge is locked, and you described that, right --

Engineer: There are those four splice bars that are there, and they're a faded orange color, and they're separated from the bridge as the bridge makes its swing. Once the rails line up to each other, then those four bars come over and engage into the rail.

…Engineer: And as I went over with my engines, you know, the ones that are on my side, I can see. I can see that they're lined and locked. They're not gapped or anything like that and yesterday there was no gap in them. Everything was tight to the rail.

Following is the conductor's explanation of how he inspected the bridge on the day of the accident:

Conductor: I got off the, I got off the engine. I walked the bridge. I check. I see that the bridge is lined and locked. I got back on the engine. I tell Mark the bridge is lined and locked.

Question: Okay. All right. When you went down to check the bridge, what do you actually check?

Conductor: There are like these orange, reddish orange clamps. I make sure that they are against the rail.

Both the engineer and conductor believed the bridge was lined and locked for their movement before operating the train over the bridge.

Train Dispatcher and Red Signals at the Paulsboro Moveable Bridge

In general, operating crews encounter two types of wayside block signals. There are automatic block signals and control signals. Sometimes these signals are distinguished by the indication they can display. The control signals when red display a "Stop" indication. The automatic block signals when red display "Stop and Proceed" or "Proceed at Restricted Speed" indication. The key is that the automatic block signals allow the operating crews to proceed when the signal is red without receiving formal permission from the train dispatcher.

The automatic block signals are recognized by a plate with numbers attached to the mast of the signal. The numbers are the signal's identification and are often close to the milepost nearest to the wayside signals location. The signal indication portion of the rulebook or timetable instructs the operating crews the requirements when these signals are encountered. Each of the different aspects (colors of the signal) requires a different response. The most restrictive aspect that an automatic block signal can display is a red. Some railroads require a crew to stop and proceed at restricted speed and some railroads require a crew to reduce the speed of the train to restricted speed and continue without stopping. The automatic block signals circuitry is dependent on the condition of the signal block directly ahead of the signal and responds to train occupancy or a disruption of that circuit. Automatic block signals are not controlled by a train dispatcher and do not appear on the display screens at a train dispatcher's work station.

Control signals do not have a plate on the signal mast. When these signals display a red aspect they require the train to stop before passing the signal. Normally, these signals are connected to the train dispatchers work station. The train dispatcher can affect these signals from his work station and use them to control the train movements in a traffic control system. Control signals are used to establish control points within a railroad signal system. The train dispatcher can observe whether the signal is clear or if the signal is not clear within the system.

When red, these signals require permission from the train dispatcher before the train can pass the signal. Before the train dispatcher provides this permission several tasks are performed. The train dispatcher must be assured that he is not authorizing unknowing opposing trains into the same block. The train dispatcher also must "block" all of the devices that can potentially change their positions. These would include remotely controlled switches the train may go over but also other control signals that control entry into the block to be occupied by the train

The signals that protected the Paulsboro Bridge were control signals (there was no plate on the signal mast) which always required the crews to stop the trains before passing when the signal displayed a red aspect. However, these signals at the bridge were not connected to the train dispatchers work station. Further, the train dispatcher did not have an indication of the bridge position on the dispatcher's display. Since, the control signals displayed a "Stop" indication and not a "Stop and Proceed" when red, the operating crews were required to obtain permission from the train dispatcher before proceeding by the red signal.

The train dispatcher did not have the ability to "block" the bridge or affect any of the other signals at the bridge before giving permission for the crew to proceed by the "Stop" indication.

The Conrail lesson plans for training the train dispatchers contained a section covering authorizing trains to pass a red (Stop) signal according to Rule 241. Specifically, Rule 241, Part d., addressed the inspections of moveable bridges by a qualified employee. The train dispatchers were given the following information during training concerning the red (Stop) signal:

241 Passing a Stop Signal

Focus = Train or track car must be stopped at signal before permission given

…

- Part 'd' - a qualified employee can be a trainman, if he'll take the responsibility. If crewmember determines that rails or locks do not align, then call trouble desk.

…

Most Recent Train Movement

A northbound CSXT train was the most recent train to pass over the bridge prior to the accident train. They went over the bridge at approximately 11:00 p.m. on November 29, 2013. The engineer stopped at the red signal protecting movement over the bridge and entered the appropriate code for the bridge to close. The bridge made the following announcements[10] while closing;

11:08:51 – 11:09:08 Bridge: "Conrail Paulsboro New Jersey Moveable Bridge Closing, Out"

Once the bridge closed the signal changed from red to green and the train proceeded across the bridge. When the train cleared the bridge with the rear end of the train (the head end of the train was over a mile away) the bridge made the following announcements:

11:15:37 – 11:15:47 Bridge: "Conrail Paulsboro New Jersey Moveable Bridge Failed to Operate, Out"

11:19:34 – 11:19:43 Bridge: "Conrail Paulsboro New Jersey Moveable Bridge Closed, Out"

The northbound train crew then passed the defect detector at MP 11.0 with the rear end of their train and heard the following announcement:

11:24:09 – 11:24:33 Defect Detector (MP 11.0): "…no defects…"

Then almost a minute later the bridge made the following announcement:

11:25:31 – 11:26:05 Bridge: "Conrail Paulsboro New Jersey Moveable Bridge Failed to Operate, Out"

When the engineer of the northbound train was asked if he heard these transmissions he said that he had. He then added that he probably should have reported the failure message to the train dispatcher. Since, the train crew did not call the train dispatcher for permission to go by a red signal at the bridge (the signal cleared) and the crew did not report the "failed to operate" message to the train dispatcher, there was no logged problem with the bridge for this date and time.

The timetable[11] provides instructions for the crews and states in a note following the proper operation of the moveable bridge the following instructions:

[10] These announcements were taken from the audio recordings made at the train dispatching center.

[11] Conrail Timetable No. 9, effective June 20, 2011, 6:01 p.m., Eastern Standard Time, Penns Grove Secondary, 9. District Instructions, b. Moveable Bridges…, page 99-100.

NOTE: Failure to display a proceed indication or failure of system to broadcast messages announcing bridge opening must be reported immediately to the South Jersey Train Dispatcher.

Previous Bridge Malfunctions

When an operating crew reported problems with the Paulsboro Bridge to the train dispatcher, the normal process was for the train dispatcher to notify the "trouble desk". The trouble desk logged the problem and called the appropriate maintenance supervisor to address the issue. Conrail provided the logged "trouble desk" reports for the last year in connection with the Paulsboro Bridge. (See Appendix E) There were 23 problems reported to the train dispatcher and relayed to the "trouble desk" between December 1, 2011 and the November 30, 2012 derailment. Between December 1, 2011 and the end of October 2012 there were 12 problems reported. The east coast was struck by the major storm, Sandy, at the end of October 2012. Including October 31 up until the derailment there were 11 problems reported in the last 30 days.

After the accident, investigators sent an email to the Conrail train dispatcher's with the following three questions related to giving permission at the moveable bridge and about reporting issues with the bridge.

1) If a crew asks for permission by the red signal at the Paulsboro Moveable Bridge, what actions do you take?
2) If the signal does not clear, do you make/file a report? If yes, to whom? Is it written or verbal?
3) In reference to Question 2 above, is there ever a circumstance where it is not required [to report the malfunction]?

All of the six responses from the train dispatchers that worked the dispatcher station that included the Penns Grove Secondary were similar. They all mention the requirement for the crew (primarily the conductor) to inspect the bridge and would normally ask for verification from the crew if this had been done before authorizing the train to proceed past the red signal. If the signal would not clear they would also verbally contact the employee (trouble desk) in there office (their desk was physically in the same room as the dispatcher station) that recorded signal problems. This employee would record the event and then notify the appropriate individual to respond to the malfunction.

Operating Crew Observations

During the interview with the FC4230 engineer, he was asked, "Have you had a red signal at this bridge before?" He provided the following response.

> Yes, sir. It's been, it's been for I'm going to say the last 3 months, it's something that's been reoccurring, and we've been getting conflicting messages where the signal would turn clear and the bridge would be lined and locked for our position, but the audible message didn't come through, and as we went over the bridge, maybe two or three car lengths, it would tell us that the bridge failed to operate. So I'd call up the dispatcher right away and I'd tell him, we have conflicting messages. We have the bridge lined and locked. We have a clear signal, but instead of telling us Paulsboro movable bridge is over out, which is audible signal

we should get, it tells us that the Paulsboro movable bridge failed to operate. And it's been for like the last 3 months it's been reoccurring quite often.

Investigators interviewed a conductor and engineer that had encountered a red signal and a bridge failure on the day before the derailment, November 29, 2012 at approximately 3:00 a.m.

The engineer and conductor explained that they stopped at the bridge before passing the red signal. The engineer coded the bridge to close. When the bridge closed the signal did not clear to a green aspect. The conductor then examined the bridge and found about a four inch gap at the north end of the bridge where the rail slides together after the bridge closes. They notified the train dispatcher and a bridge and building employee was sent to the bridge. Meanwhile, the crew attempted to code the bridge to close several times. When the bridge and building employee arrived he noted the bridge was closed and the gap no longer existed and told the crew it was okay to proceed. The crew contacted the train dispatcher and received permission to pass the red signal.

Audio Recordings of Operating Crew

Using the logged problems documented by the trouble desk, the audio recordings from the operating crews that had problems at the bridge could be isolated. The crew recordings that reported problems in November were transcribed. There were repeated references to the North end of the bridge not locking. On one of the recordings the engineer explained that the bridge announced a "bridge malfunction" message after he had proceeded over the bridge with his locomotive a short distance and while his train still occupied the bridge.

Method of Operations

Trains were authorized by a Form D that was issued directly to the operating crews by radio from the train dispatcher. The Form D authorized the train movements from one named station to another. The territory was non-signaled territory and generally operated one train at a time.

Operating Documents

The crews were governed by the NORAC rule book, 10th edition, and effective November 6, 2011. At the time of the accident, the current timetable was Conrail Timetable No. 9, effective June 20, 2011, 6:01 p.m., Eastern Standard Time.

Summary Bulletin Order (9-S-3)

Bulletin Orders (9-1, 9-2, 9-3, 9-4, and 9-5)

Daily Bulletin (9-529, issued November 29, 2012 at 6:01 pm)[12]

Division Notice 9-5-1, 9-5, 9-21, and 9-22)

[12] Instead of issuing individual bulletins to the trains, Conrail posts these documents that are applicable to all train movements for the next 24 hours and issued daily at 6:01 p.m.

Form D Authority to proceed from CP Woodbury to Deep

In addition to those instructions above the operating crews also have the following documents:

NS-1 Rules for Equipment and Operation and Handling – Effective January 1, 2012

United States Hazardous Material Instructions for Rail – Dated 01/01/2012 (Conrail)

Safety Rules and General Responsibilities for All Employees – Effective June 1, 2002

Restricted Equipment Rules – Effective January 15, 1999 (Revised May 1, 1999)

Crew Information

Engineer

The engineer was 51 years old. He hired on the railroad April 14, 2003 as a trainman. In 2004, he was promoted to locomotive engineer. Over the next eight years, he worked as an engineer and as a conductor depending on Conrail's business fluctuations. He had operated on the Penns Grove Secondary for the last 14 months.

S*leep/wake/work cycle*

The engineer had worked this particular job for the previous 14 months and had a routine that seldom varied. His last day off was Tuesday. He went to bed at 7:00 p.m. every night and required the rest of the family to respect this as a quiet time. He would then wake at 1:30 a.m. to prepare for work. The on duty time was 3:00 a.m. When asked, he said he felt rested the day of the accident.

Operational Testing

During the previous 12 months the engineer had been observed by Conrail supervisors on 66 different days. The engineer was observed complying with multiple rules on each of those dates. There were 46 entries in the testing records where he was observed properly complying with a signal that displayed Stop (Rule 292) and there were 10 entries that indicated that he properly complied with passing a Stop signal associated with a moveable bridge (Rule 241 d.)

Discipline Records

In his discipline records, it indicated that he had a 45 day suspension on September 4, 2009, in connection with the rules covering signals. He had a 10 day suspension deferred on August 15, 2007 in connection with the failure to secure equipment when working as a conductor.

Training and 49 CFR Part 240 Engineer Certification

The engineer was current and within his three year locomotive engineer certification cycle. His most recent rules examination was January 25, 2012 and he scored a 95 percent passing grade.

Conductor

The conductor was 42 years old. He hired on the railroad September 22, 2008, as a trainman. When he completed the training program (OJT), he was promoted to conductor in August 2009. He had operated on the Penns Grove Secondary before but this was only his third day operating on this road job. He had spent the majority of his career working vacant jobs as an extra board employee.

Sleep/wake/work cycle

The conductor had worked this particular job for the previous two days after being off on Tuesday, November 27th. He said that when he got home from work each day, in the early afternoon, he would have a 1 to 1 ½ hour nap. He got up when his children came home from school and stayed up until they all went to bed between 7:30 p.m. and 8:00 p.m. He would then wake at 1:00 a.m. to prepare for work. The on duty time was 3:00 a.m. When asked, he said he felt rested the day of the accident. His routine had not changed since Tuesday.

Operational Testing

During the previous 12 months the conductor had been observed by Conrail supervisors on 22 different days. The conductor was observed complying with multiple rules on each of those dates. There were 17 entries in the testing records where he was observed properly complying with a signal that displayed Stop (Rule 292). There were no entries that indicated he had been observed properly inspecting a moveable bridge (Rule 241 d.)

Discipline Records

In his discipline records, it indicated that he had a 30 day suspension on July 8, 2009, in connection with the operating rules. And he had a 30 day suspension August 12, 2009, in connection with operating through a switch in the wrong position. In August 5, 2011 he received a reprimand for operating through a switch in the wrong position. Again, In January 12, 2012 he received a 10 day suspension for operating through a switch in the wrong position.

Training

The conductor's most recent rules examination was January 23, 2012 and he scored a 95 percent passing grade.

Train Dispatcher

The train dispatcher was 53 years old. He hired on the railroad as a trainmen on September 19, 1994. In 1996 he transferred to the position of train dispatcher.

Operational Testing

During the previous 12 months the train dispatcher had been observed by Conrail supervisors on 127 different days. The train dispatcher was observed complying with multiple rules on each of those dates. There were 50 entries in the testing records where he was observed properly complying with Rule 292 which covers Stop signals. There were 29 entries that

indicated he had been observed properly authorizing a train by a Stop signal associated with a moveable bridge (Rule 241 d.)

Discipline Records

His discipline record had no entries.

Training

The train dispatcher's most recent rules examination was September 18, 2012 and he scored a 100 percent passing grade.

Management Overview

Operational Testing

Title 49 CFR 219.9 **Program of operational tests and inspections,** contains specific requirements for the testing and observations of operating employees while they perform their duties. Conrail maintains an operational testing program to monitor the performance and rules compliance of employees operating trains. Conrail provided records of observations that were performed on the Penns Grove Secondary.

The purpose of the operational testing program is to observe operating crew's activities when they are unaware that a supervisor is present. Conrail had performed operational testing in the same area as the accident to determine how well the crews were complying with a varied number of operating rules. According to the data between November 2011 and November 2012, the Conrail managers had monitored 151 events where employees had encountered a red (Stop) signal indicated by the records showing compliance with Rule 292. Thirteen of these events were at a moveable bridge indicated by the records showing compliance with Rule 241 d. There were no entries that indicated a crew had not complied properly with either of these rules.

Training and Written Examinations

Title 49 CFR 217.11 **Program of instruction on operating rules; recordkeeping; electronic recordkeeping,** contains requirements for training employees on the operating rules. Conrail provided the lesson plans used to instruct and train the operating employees in compliance with this regulation. The training lesson plans for the operating crews did not contain specific instructions related to inspecting the moveable bridges when stopped by a red signal. There were no posters or job guides available that informed the crews what to look for when inspecting the moveable bridges. Several informal discussions with operating crews at the Pavonia Yard office and the Paulsboro Yard office revealed that the crews had never received formal training as to how to inspect the moveable bridge. When asked, the Manager of Field Operations at Pavonia Yard confirmed that there were no formal instructions related to the proper inspection of the moveable bridge when the stop signal displayed a red aspect and would not clear.

The Conrail Manager of Operating Rules and Regulatory Compliance agreed that there were no written instructions and the training program did not contain a formal section covering

the proper method of inspections for the moveable bridge when the signal would not clear or change to green.

Following is an excerpt from the interview with the conductor of the accident train when asked what to look for when inspecting the bridge and how he had received his training in connection with the moveable bridge inspections:

> A. There are like these orange, reddish orange clamps. I make sure that they are against the rail.
> Q. Okay. Is that instruction in the timetable telling you what to look at?
> A. No, they actually showed me.
> Q. They showed you?
> A. Yes.
> Q. When did they do that?
> A. During training.
> Q. Okay. Who is it that showed you?
> A. J. J. Rainey (ph.).
> Q. Is he a training officer or --
> A. No, he's a conductor.
> Q. So it's like a student trip and --
> A. Yeah.
> Q. -- or in training --
> A. Yes. It was 4 years ago.
> Q. Okay. And how did he know what to check?
> A. That I don't know.
> Q. Had you been required to check the bridge before?
> A. This was the first time I had to check it.
> Q. First time?
> A. Yes.

Postaccident Actions

Conrail

Following the accident, Conrail issued the following Daily Bulletin in response to a request from the FRA:

> CONSOLIDATED RAIL CORPORATION
> MOUNT LAUREL, NJ
> SOUTH JERSEY DISPATCHER
> Daily Bulletin Order No. 9-533
> Monday, December 03, 2012
> EFFECTIVE: 6:01 P.M.
> CURRENT INFORMATION

THE FOLLOWING IS IN EFFECT AT ALL MOVEABLE BRIDGES ON CONRAIL.

THE TRAIN DISPATCHER WILL NO LONGER GIVE 241 PERMISSION PAST STOP SIGNALS GOVERNING ENTRANCE TO MOVABLE BRIDGES. CREWS WILL NOTIFY THE DISPATCHER WHO IN TURN WILL INFORM THE C&S TROUBLE DESK.

Further, Conrail made arrangements for only bridge maintenance employees to inspect the bridges under these circumstances.

Federal Railroad Administration

The FRA issued the following safety advisory following the Paulsboro Moveable Bridge derailment:

DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration
Safety Advisory 2013–01; Passing Stop Signals Protecting Movable Bridges

Recommended Action: In light of the above discussion, FRA recommends that track owners and railroads:

1. Evaluate the design of existing movable bridges, especially swing bridges, to determine if effective span locking, independent of rail locking, is being provided as recommended in Chapter 15 (Steel Structures) of the current American Railway Engineering and Maintenance-of-Way Association Manual for Railway Engineering.

2. Evaluate operating rules and procedures that permit the operation of trains past a stop signal protecting a movable bridge to ensure their adequacy to prevent operation of trains should the bridge not be properly aligned and secured.

3. Review the adequacy of all training given to employees authorized to determine that a movable bridge is properly aligned and locked to ensure that employees are capable of correctly determining that the movable bridge is safe for train movements.

FRA encourages track owners and railroads to take actions that are consistent with the preceding recommendations and to take other actions to help ensure the safety of the Nation's railroads, their employees, and the general public.

FRA may modify this Safety Advisory 2013–01, issue additional safety advisories, or take other appropriate actions it deems necessary to ensure the

highest level of safety on the Nation's railroads, including pursuing other corrective measures under its rail safety authority.

Issued in Washington, DC, on February 22, 2013

- END -

Appendix A

Excerpts from Conrail Timetable No. 9, effective June 20, 2011, 6:01 p.m., Eastern Standard Time, Page 99.

PENNS GROVE SECONDARY (PENS)

9. DISTRICT INSTRUCTIONS

B. MOVEABLE BRIDGES – NOT PART OF AN INTERLOCKING RADIO CONTROLLED OPERATION

Instructions Governing the Operation of Moveable Bridges shown

Normal position of moveable bridge is **OPEN**.

1. Trains must approach moveable bridge prepared to stop.
2. Verify river traffic is clear of moveable bridge.
3. To close moveable bridge for rail traffic, key in request code and * using the keypad of the locomotive or portable radio.
4. Warning message will be broadcast over radio and loudspeakers on bridge announcing closing of bridge.
5. When moveable bridge is completely closed, message will be broadcast over radio and loudspeakers confirming closing. A signal to proceed will then be displayed.
6. To stop the bridge at any time, key in the request code and #. A message will be broadcast over the radio and loudspeakers indicating process has been halted. To restart the closing sequence, again key in the request code and *.
7. After train proceeds and is clear of bridge circuit, the moveable bridge will automatically open. A message will be broadcast over radio and loudspeakers confirming the opening.

NOTE: Failure to display a proceed indication or failure of system to broadcast messages announcing bridge opening must be reported immediately to the South Jersey Train Dispatcher.

Failure of Moveable Bridge to close when requested by Radio Command:

1. Open control panel case marked T/E using switch key. Control panel case is located on west side of track on both sides of bridge.
2. Press the "CLOSE" button; radio and loudspeaker warning broadcast will commence.
3. To stop the bridge, press the "CLOSE" button. A message will be broadcast over the radio and loudspeakers indicating process has been halted. To restart the closing sequence, again press the "CLOSE" button.
4. Once bridge is closed, close and lock case.
5. When signal indication to proceed is displayed, train may proceed across moveable bridge.
6. After train proceeds and is clear of bridge circuit, the moveable bridge will automatically open. A message will be broadcast over the radio and loudspeakers confirming the opening.

NOTE: Failure to display a proceed indication or failure of system to broadcast messages announcing bridge opening must be reported immediately to the South Jersey Train Dispatcher.

Appendix B

Radio Recordings

November 29, 2012 (PM) – Northbound CSXT Train K43328

11:08:51 – 11:09:08	"Conrail Paulsboro New Jersey Moveable Bridge Closing, Out"
11:15:37 – 11:15:47	"Conrail Paulsboro New Jersey Moveable Bridge Failed to Operate, Out"
11:19:34 – 11:19:43	"Conrail Paulsboro New Jersey Moveable Bridge Closed, Out"
11:24:09 – 11:24:33	(Defect detector MP 11.0) "…no defects…"
11:25:31 – 11:26:05	"Conrail Paulsboro New Jersey Moveable Bridge Failed to Operate, Out"

November 30, 2012 (AM) – Southbound Train FC4230 (CSXT 8817)

5:58:18 – 5:59:57	Received Form D CP Woodbury to Deep "6:02 am"
6:28:29 – 6:28:39	Entered Penns Grove Secondary at CP Woodbury
6:42:26 – 6:43:01	(Defect detector MP 11.0) "…no defects…"
6:49:40 – 6:49:55	Keypad beep sequence then, "Conrail Paulsboro New Jersey Moveable Bridge Closing, Out"
6:54:00 – 6:54:21	Keypad beep sequence (repeat) Keypad beep sequence.
6:55:08 – 6:55:16	Keypad beep sequence
6:55:49 – 6:55:57	Keypad beep sequence
6:56:09 – 6:57:35	Engineer: "…the bridge was closed we got a stop signal displayed the conductor walked it we hit the code prompt a few times to see if it would pop up clear but it had not." Dispatcher: "Is the bridge lined locked for your movement there?" Bridge: "Conrail Paulsboro New Jersey Moveable Bridge Failed to Operate, Out" Engineer: "Yeah, it's giving us a failed to operate but it is lined and locked, the conductor walked it, showing us a stop signal." Dispatcher: "Okay, CA11 CSXT 8817, permission by the stop signal at the Paulsboro moveable bridge single to single south direction." Engineer: "CSXT 8817 has permission by the stop signal at the Paulsboro moveable bridge single to single track Penns Grove south."

6:59:59 – 7:02:02	Engineer: “CA 11 to South Jersey, Emergency, Emergency, Emergency” “…the bridge is down…” “…vapor trail behind us…”
7:05:04 – 7:05:41	“We have 5 cars on track, Line 6 hopper with plastics, all kind of vapor here… … I’m not sure where it is?”
7:15:47 – 7:16:28	Engineer: “They want us to cut away.”
7:32:16 – 7:32:36	The Engineer and Conductor departed the scene with the engines.

Appendix C

Excerpts from Train Dispatcher's Manual of Instructions and Guidelines (Effective May 2011, First Edition)

NORAC RULE 241. Passing a Stop Signal

To pass a Stop Signal, a train must have verbal permission of the Dispatcher (or Operator when authorized by the Dispatcher). Permission must not be given or accepted until the train has stopped at the signal. A member of the crew must contact the Dispatcher or Operator and follow his instructions.

a. Giving Permission to Pass

Before giving permission to pass the Stop Signal, the Dispatcher (or Operator) must determine that:

1. Affected appliances are properly positioned. If the position of a switch cannot be determined, the route must be inspected.
2. No opposing or conflicting movements have been authorized.
3. Blocking devices have been applied to protect against opposing movements whenever the Stop Signal involved governs entrance to a track where Rule 261 is in effect.

The Dispatcher (or Operator) must give permission to pass a Stop Signal in the following manner:
"No. 5316 engine 4129 pass Stop Signal on No.2 track at Rare and proceed east to No. 1 track."
The receiving employee must repeat this permission and the Dispatcher or Operator must then confirm it.

d. Stopped at a Signal Protecting Movable Bridge

Under the following conditions, a qualified employee must determine that the rails are properly lined and the bridge is safe for movement before verbal permission is given to pass the signal:

1. When the signal cannot be displayed for the first movement over a bridge after the bridge has been closed, regardless of bridge lock indication.

OR

2. At any time a bridge unlock indication is received.

Bridge Name: Paulsboro
Division: South Jersey
Bridge #: D 13.7
Type Bridge: Deck Girder/Swing
River Crossing: Mantua Creek
CFR Regulations: Remote closing F/ Train Traffic
Operational Guidelines: Closes for passage of trains; From 3/2 to 11/30; 4 HR Notice 12/1 to 3/1

Appendix D

Excerpts from:
United States Hazardous Materials Instructions for Rail
1/1/12 (HM1)

3. WHEN AN EMERGENCY OCCURS

SAFETY IS OF FIRST IMPORTANCE.

Carry out the following actions as closely as possible; however, on-scene judgment based on actual circumstances must be the final guide for protecting people, property, and the environment.
a. Make an emergency call, as radio rules require.
b. Look for a fire or vapor cloud.
c. Rescue the injured if qualified, without endangering yourself or others. Warn and keep everyone at a safe distance until it can be determined what, if any, chemicals are involved.

WHEN A FIRE OR VAPOR CLOUD IS VISIBLE

a. Take the shipping papers and ***Emergency Response Guidebook*** and move yourself and other crewmembers upwind to the farthest distance recommended in the Evacuation Section of the emergency response information accompanying the shipping papers or the ***Emergency Response Guidebooks*** green pages that provide initial isolation distances.
b. Stay out of ditches and low areas.
c. ***Do Not Smoke or use fusees.***
d. Provide the Train Dispatcher or Yardmaster with as much of the following information as possible:
(1) specific location of the emergency (station, mile post location, nearest street or crossing);
(2) type of emergency;
(3) status of crewmembers;
(4) cars involved, including each car's initials and numbers and its extent of involvement (for example, leaking, derailed, or on fire);
(5) surroundings (for example, proximity to populated areas, local bodies of water or nearby drainage ditches or storm sewers; description of terrain; location of access roads; weather conditions);
(6) resources required to handle situation (for example, fire, ambulance, and law enforcement agencies); and
(7) location where a crewmember with shipping papers will meet arriving emergency response personnel.
e. Once you are in a safe location, identify yourself and cooperate with the local emergency response personnel as noted in **Item 6** of this section.

COOPERATING WITH LOCAL EMERGENCY RESPONDERS

a. Share any requested information from the shipping papers with emergency response personnel.
(1) Provide an extra copy of the train consist/list, when available.

NOTE: Retain any waybills and a copy of the train consist/Train List until you can deliver them to the first railroad manager on the scene.
(2) Provide the **Emergency Response *Guidebook*** along with a copy of the emergency response information provided with the shipment.
(3) Note the time, along with the name and title of the person provided with this information.
b. Help emergency response personnel identify cars and the commodities involved. Use shipping papers or observations from a safe location to accomplish this task.
c. Remain at the scene, at a safe distance, until a railroad manager relieves you.
d. Give the first railroad manager on the scene an oral description of the incident and indicate any assistance you provided emergency responders.
e. A railroad spokesperson will handle discussing the incident with the media or other non-emergency response personnel.

Appendix E

Previous Bridge Failures

(The following table was developed from the failure logs kept by the train dispatchers. The complete log is part of the Public Docket.)

Date	Time	Problem	Cause	Repairs	Notes
12/1/11	1:33 am	Bridge won't close	Debris	Remove debris	Operating crew reported bridge half open and won't open or close. Maintenance crew found debris, removed and closed bridge for season.
Bridge is closed and routed for rail traffic; no remote operations required and signal should be green (clear) at bridge.					
12/2/11	5:04 pm	Signal at red (stop)	Temperature changes	Adjusted North proximity detector	Maintainer will be called during normal hours – no overtime available.
Bridge is closed and routed for rail traffic; no remote operations required and signal should be green (clear) at bridge.					
3/1/12	Bridge is re-opened for the season and requires remote operations by crews.				
3/27/12	8:21 am	Bridge failed to close	Unknown	Tested/None	Would not duplicate problem for maintainer.
4/3/12	8:39 am	Signal at red (stop)	Defective sensors	Replaced	Replaced a defective proximity detector.
4/22/12	4:44 pm	Bridge failed to open	Vibration	Tighten miter rails	Supervisor informed
4/25/12	8:40 am	Bridge will not drop		Removed branch from bridge seat	Supervisor sent maintainer
7/5/12	3:27 pm	Signals at red (stop)	Defective sensors	Replaced	Replaced a defective proximity detector.
7/10/12	5:07 am	Signals at red (stop)	Rail shifted	Adjusted proximity switch	
7/20/12	4:24 pm	Signal at red (stop)	Weather temperature drop	Adjusted #3 and #4 proximity switch	Maintainer reported adjusted proximity switches at North end of bridge due to rail shrinkage.
9/11/12	6:33 am	Signal at red (stop) South	Investigating	None	No problem found
9/17/12	6:36 am	Signal at red (stop) South	Rail shifting	Adjusted #3 and #4 proximity switch	Maintainer reported adjusted proximity switches at North end of bridge due to rail shifting.
10/27/12	9:00 am	Bridge failed to open	Unknown	Cleared error; tested	
10/31/12	3:30 pm	Bridge won't lock	Debris	Maintainers removed debris from seat and from gears that control seat.	Maintainers reported to supervisor.
11/3/12	1:21 am	Bridge announced failure	Unknown	None	Operating crew reports bridge locked and signal displayed but heard "failed to close" announcement. Next train talked by red signal at bridge.
11/5/12	3:59 pm	Bridge failed to open	Investigating	Adjust proximity detector	Inspector reports north side rail pumping under train movement causing proximity detector to break contact.
11/6/12	4:02 pm	Bridge failed	Investigating	Cleared error	Operating crew reported bridge

		to open		code	announcement “failure to operate”.
11/16/12	11:15 pm	Signal at red (stop) North	Nothing found	Operated and tested	
11/17/12	11:27 am	Bridge failed to close	Unknown	Reset bridge	
11/19/12	11:15 pm	Signal at red (stop) South	Investigating	Reset bridge circuit	Operating crew found bridge not locked after inspecting.
11/21/12	6:26 am	Bridge failed to open	Investigating	None	
11/26/12	7:19 am	Bridge failed to lock	Debris	Removed debris	
11/28/12	7:52 am	No signal at approach	Bulb out	Replaced bulb in approach signal	
11/29/12	3:17 am	Bridge failed to close	Investigating	None	Operating crew reported bridge stopped 4 inches before completely closing. Closed after several attempts signal displayed but bridge did not announce. Train crossed and bridge announced failure to operate.
11/30/12	7:05 am	Train Derailed			

Appendix F

NORAC rule book, 10th edition, and effective November 6, 2011, Rule **241.**

241. Passing a Stop Signal
To pass a Stop Signal, a train must have verbal permission of the Dispatcher (or Operator when authorized by the Dispatcher). Permission must not be given or accepted until the train has stopped at the signal. A member of the crew must contact the Dispatcher or Operator and follow his instructions.

a. Giving Permission to Pass
Before giving permission to pass the Stop Signal, the Dispatcher (or Operator) must determine that:

1. Affected appliances are properly positioned. If the position of a switch cannot be determined, the route must be inspected.
2. No opposing or conflicting movements have been authorized.
3. Blocking devices have been applied to protect against opposing movements whenever the Stop Signal involved governs entrance to a track where Rule 261 is in effect.

The Dispatcher (or Operator) must give permission to pass a Stop Signal in the following manner:

"No. 5316 engine 4129 pass Stop Signal on No.2 track at Rare and proceed east to No. 1 track."

The receiving employee must repeat this permission and the Dispatcher or Operator must then confirm it.

b. Movement After Permission Has Been Confirmed
After permission has been confirmed, the train must operate at Restricted Speed until the entire train has cleared all interlocking or spring switches and the leading wheels have:

1. Passed a more favorable fixed signal,
or
2. Entered non-signaled DCS territory,
or
3. Entered Rule 562 territory with a Form D authorizing Rule 563.

In CSS territory, trains with operative cab signals must not increase their speed until they have run one train length or 500 feet (whichever distance is greater) past a location where a more favorable cab signal was received.

c. Stopped at Automatic Interlocking Home Signal
When a train is stopped at a home signal at an automatic interlocking and no immediate conflicting movement is evident, the movement will be governed by:

1. Instructions posted at that location.
2. Instructions in the Timetable.

Track cars may proceed after first determining that there are no approaching or conflicting movements.

d. Stopped at a Signal Protecting Movable Bridge
Under the following conditions, a qualified employee must determine that the rails are properly lined and the bridge is safe for movement before verbal permission is given to pass the signal:

1. When the signal cannot be displayed for the first movement over a bridge after the bridge has been closed, regardless of bridge lock indication.
or
2. At any time a bridge unlock indication is received.

e. Stop Signal Disregarded
If a Stop Signal is disregarded, the Dispatcher or Operator must immediately take two actions:

1. Attempt to stop that train and other trains involved.
2. Notify the next TBS or interlocking station.