NATIONAL TRANSPORTATION SAFETY BOARD

Office of Railroad, Pipeline and Hazardous Materials Investigations

WASHINGTON, D. C. 20594

Operations Factual Addendum

ACCIDENT

Description: Train Head-On Collision

Location: Cayce, South Carolina

Accident Date: February 4, 2018

Report date: October 19, 2018

NTSB accident number: RRD18MR003

Keys #: 96691

Party Members

Tomas Torres NTSB-Operations Group Chairman	Michael Hoepf, Ph.D. NTSB-Human Performance Group Chairman
Gregory Drakulic FRA Railroad Safety Specialist- Chief Inspector	Steve Ammons CSXT-Director Train Handling Rules & Practices
Matt Campbell SMART-Georgia State Legislative Director	Bryan Aldridge BLET- Primary Investigator, Safety Task Force
Marcus Landy South Carolina Operating Practice Inspector Office Regulatory Staff	Stephen Reaves Amtrak Senior Director, Compliance & Certifications Safety Compliance and Training

Operations Information

Following the completion of the on-scene portion of the investigation, the NTSB requested additional documents, conducted further interviews, and held an investigative hearing. Operations information from these sources is presented in this addendum.

Investigators requested and received a copy of one-year operational testing records for the CSXT trainmasters and conductor and engineer in Cayce, South Carolina.

Conductor Information

The CSXT Conductor's EC-1(TWC) forms show that between 05/22/17 and 02/03/18 the Conductor worked in TWC territory 20 times. On 6 occasions that the conductor worked in EC-1 (TWC) territory it involved the operation of main track switches.[1] ,[2]

CSXT Conductor operational testing records are from 05/23/17 through 12/02/17. The Conductor records did not show operational tests for the accident location, S 366.9, S367.0, S 367.4, S 367. 9.

The table shows Conductors operational test on CSXT operating rules pertaining to operating a switch, EC-1 authority, Switch Position Awareness Form (SPAF) that the conductor was tested or not tested. on [3], [4]

Table. 1

Switch operating Rule	Number of times Tested	Pass/ Fail
401.2	3	Pass
401.3	2	Pass
401.4	0	
401.5	0	
401.6	0	
401.7	0	
401.8	1	Pass
401.9 On main track, signaled track, or sidings the normal position for hand operated switches is for movement on those tracks	0	

[1] Form EC-1 - A form used to record specific instructions or dispatcher messages from the train dispatcher regarding movements on controlled tracks.

[2] Track Warrant Control (TWC) - A method of authorizing movements or protecting employees or on-track equipment in signaled or non-signaled territory on controlled track within specified limits. Movement within TWC territory is under the jurisdiction of the train dispatcher.

[3] Refer to Appendix for description of the CSXT Switch Operating Rules.

401.10	0	
401.11	0	
401.12 Line switches and derails for their designated normal position	0	
401.13 Restore switches and derails on controlled tracks to their normal position before the movement is reported clear to the train dispatcher	0	
401.14 Before departing a location where main track switches have been operated by hand, each crewmember must verbally confirm the position of the switches and that they have been locked	0	
EC1 Operational Rules 501	0	
Switch Position Awareness Form	0	
503.6 A train instructed to take siding in TWC-D or TWC-ABS territory must report clear to the train dispatcher once the train has cleared the main track and switches have been restored for movement on the main track.	0	

Engineer Information

CSXT engineer operational testing records are from 05/23/17 through 12/02/17

On 12/24/17 he was tested at accident location S367 for the following operational rules:

- 407.1 leaving equipment in the clear
- 406.2 Shoving equipment
- 406.1 Shoving equipment/ being involved on unrelated tasks.

The table shows the CSXT operatiing rules pertaining to operating a switch, EC-1 authority, Switch Position Awareness Form (SPAF) that the engineer was tested or not tested on.

Table. 2

Switch operating Rule	Number of times Tested	Pass/ Fail
401.2	0	

401.3	4	Pass
401.4	0	
401.5	0	
401.6	0	
401.7	0	
401.8	0	
401.9 On main track, signaled track, or sidings the normal position for hand operated switches is for movement on those tracks	0	
401.10	0	
401.11	0	
401.12 Line switches and derails for their designated normal position	0	
401.13 Restore switches and derails on controlled tracks to their normal position before the movement is reported clear to the train dispatcher	0	
401.14 Before departing a location where main track switches have been operated by hand, each crewmember must verbally confirm the position of the switches and that they have been locked	0	
EC1 Operating Rules 501	0	
Switch Position Awareness Form	0	
503.6 A train instructed to take siding in TWC-D or TWC-ABS territory must report clear to the train dispatcher once the train has cleared the main track and switches have been restored for movement on the main track.	0	

CSXT Trainmaster #1 Information

Train Master #1 Operational Testing Record are from 01/03/17 through 12/28/17. Testing records are for all the employees under the Trainmaster's supervision

Table. 3

Switch operating Rule	Number of times Tested	Pass/ Fail
401.1	3	Pass
401.2	133	Pass
401.3	149	Pass
401.4	0	
401.5	0	
401.6	0	
401.7	0	
401.8	115	Pass
401.9 On main track, signaled track, or sidings the normal position for hand operated switches is for movement on those tracks	0	
401.10	0	
401.11	0	
401.12 Line switches and derails for their designated normal position	0	
401.13 Restore switches and derails on controlled tracks to their normal position before the movement is reported clear to the train dispatcher	0	
401.14 Before departing a location where main track switches have been operated by hand, each crewmember must verbally confirm the position of the switches and that they have been locked	0	
EC1 Operating Rules 501	0	
Switch Position Awareness Form	0	
503.6 A train instructed to take siding in TWC-D or TWC-ABS territory must report clear to the train dispatcher once the train has cleared the main track and switches have been restored for movement on the main track.	0	
Test at accident location		

Test at S366.9	0	
Test at S367	390	Pass
Test at S367.4	0	
Test at S367.9	0	

Trainmaster #1 Recorded Operational test failures.

Table. 4

Rules Failures	Date	Event
100.1, GS13.2b, GS13.17	01/27/17	3 failed tests entered on the same employee
405.5	05/23/17	1 failed entered for one employee
408.2, 408.1, 405.8, 409.2c, 409.4,	06/29/17	5 failures entered on one employee
314.5	12/14/17	1 failed test entered for one employee
Total Test entered of 2017	2670	
Total Test Comply	2660	
Total Test Fail	10	

CSXT Trainmaster #2 Information

Trainmaster #2 operational tests records from 01/04/17 through 12/28/17. Testing records are for all the employees under the Trainmaster's supervision

Table. 5

Switch operating Rule	Number of times Tested	Pass/ Fail
401.2	3	Pass
401.3	2	Pass
401.4	0	
401.5	0	
401.6	0	
401.7	0	
401.8	1	Pass
401.9 On main track, signaled track, or sidings the normal position for hand operated switches is for movement on those	0	
401.10	0	
401.11	0	

401.12 Line switches and derails for their designated normal position	0	
401.13 Restore switches and derails on controlled tracks to their normal position before the movement is reported clear to the train dispatcher	0	
401.14 Before departing a location where main track switches have been operated by hand, each crewmember must verbally confirm the position of the switches and that they have been locked	0	
EC1 Operating Rules 501	0	
Switch Position Awareness Form	0	
503.6 A train instructed to take siding in TWC-D or TWC-ABS territory must report clear to the train dispatcher once the train has cleared the main track and switches have been restored for movement on the main track.	0	
Test at accident location		
S366.9	0	
S367.0	286	Pass
S367.4	0	
S367.9	0	

Trainmaster #2 Recorded Operational Test test failures.

Table. 6

Rules Failures	Date	Event
5106, 5105, 5104	01/27/17	3 tests failures entered on one employee
409.6(1), 408.1	02/01/17	2 test failures entered for one employee
408.2, 408.1, 409.4(a), 409.4(b)	02/16/17	8 test failures entered for a train crew of 3
100.1, 405.3, 409.6(1), 409.6(2)	03/08/17	4 tests failures entered for one employee

100.1, 409.6(1), 409.6(2)	06/07/17	3 test failure entered for one employee
100.1, 401.8(5)	06/28/17	2 test failure entered for one employee
409.4, 409.2(c), 408.2, 408.1, 405.8, 401.8(5)	06/29/17	6 tests failures entered on one employee
103.7(a)	10/24/17	1 test failure entered for one employee
401.3, 100.1	11/17/17	2 test failures entered for on employee
100.4, 108.1(a), 2009.8, 205.4(a)	12/14/17	4 test failures entered for a train crew of 2
Total Test	2311	
Total Test Comply	2277	Pass
Total Fail Count	34	

Xorail Contractor- Summary of Interview

CSXT hired a Xorail Contractor to assist for the signal suspension that occurred on February 3, 2018.

During the interview Xorail Contractor stated during the interview that he had worked for the CSXT railroad for over 40 years in the transportation department. He worked as a train order operator, train dispatcher, assistant chief dispatcher, chief dispatcher, and superintendent of train operations. He taught classes on rules for the officers and train dispatchers. He is currently qualified on the CSXT Operating Rules.

Since 2011 he has been working for Xorail Corporation as a consultant for signal suspension projects. During the signal suspension projects, he acts as the liaison between the signal group on the ground and the train dispatchers at the dispatching center.

The Xorail Contractor said, “I do a lot of signal suspensions over a period of years, so -- and they're all similar, you know, pretty much as far as the planning process” (page 7).

Investigators asked, how far in advance did the planning of the February 3, 2018 signal suspension take place. He stated that two weeks prior to the signal suspension going into effect they had a conference and went over the bulletins “we'll go through the whole process of reading the signal suspension bulletins and find, you know -- getting all the T's crossed and I's dotted, so to speak, to

get everything correct" (page7)[5]. The conference was between Xorail Contractors, CSXT signal department and the CSXT transportation department. A week before the signal suspension went into effect, the Xorail Contractor and the CSXT transportation department had a final conference to make sure that nothing has changed, and everything was proper and correct. Investigators asked the Xorail Contractor who writes the bulletins for the signal suspension, he replied that he is not involved in writing the bulletins that are issued to the train dispatchers and the train crews but does review them for any discrepancies and will make suggestions to correct them. He said that another Xorail Contractor writes a draft of the bulletins and that the CSXT transportation department will make the final approval of the bulletins before they are issued to the train dispatchers and train crews.

When investigators asked the Xorail Contractor who makes the decision in the use of flagman and switch tenders, he said that it is up to the superintendent or the chief train dispatcher.[6], [7]He explained the heavier the traffic is on the subdivision, the more demand they have for switch tenders. "This subdivision, according to the division officer, didn't warrant enough traffic to have a switch tender" (page12). The Xorail Contractor said he understood that there would not be any need for flagman and switch tenders because there would not be a lot of meeting and passing of trains during the signal suspension. He said the decision is based on the CSXT officer knowing his territory, and it also could be a lack of manpower.

The Xorail Contractor said on the day of the accident at about 7:00 a.m., he had a briefing with the CSXT signal suspension Project Manager. He asked the Project Manager if his personnel were in position and ready to start the signal suspension. At about 8:00 a.m. the signal suspension Project Manager informed the Xorail Contractor that the signal personnel were in position and ready. The Xorail Contractor then informed the train dispatcher that the signal group was in position, the train dispatcher replied by saying to have the signal group put the switches in manual operation and line them according to the bulletin. Later during the day, the CSXT accident train traveled south to the auto ramps to conduct switching operations. The signal group was informed of the train traveling

[5] Bulletin - Written or electronically transmitted special instructions issued by the Operating Rules Department concerning the safety of employees and the movement of trains.
[6] Flagman - A designated employee whose only responsibility is to direct or restrict the movement of trains at a specific point to provide on-track protection for roadway workers.
[7] Switch tender means a qualified employee assigned to handle switches at a specific location.

over to the auto ramps to perform work. The signal Project Manager made the decision to preform signal system tests around the train that conducted switching operations at the auto ramps.

The Xorail Contractor was asked to explain how a signal suspension affects the train dispatcher computer display, he said “Well, the thing about the signal suspension, the screen really doesn't come into play anymore because all that territory doesn't belong to you anymore as far as you are having control over it. The only thing that screen is for you now is a reference to where you put your EC-1. And it comes up from this location to this location. But that's basically all it is, is a reference to where you've authorized this verbal authority” (page 20). The Xorail Contractor further explained that during a signal suspension the train dispatcher’s computer screen will display switches flashing and signals lined but should not pay attention to that anymore. He said that you cannot trust what you see on the computer screen account the signal department my lay down circuits for testing purposes, a track light does not necessarily mean that a switch is open.

The Xorail Contractor was asked what risk assessments were made to mitigate risk during a signal suspension, he said that job briefing could be conducted by officers, bulletins, and pretty much covered by the operating rules.

Switch Position Awareness Form

Regarding the use of SPAFs in general, the conductor indicated that he had been trained on how to complete them but did not use them extensively. He said (p.69, lines 3-7) “So me working in the yard, you know -- I mean, I've done it before, but, you know, I just don't have the repetition for it. I know what I need to write down for the most part. Like every now and then, I discover there's something new. Like you can cancel EC1, Line 1 or something. I didn't know that.” The conductor stated that the engineers would typically complete the forms for him in the cab of the locomotive, and he would report the information over the radio. He stated that he would usually look at his watch when he handled a switch. Sometimes he provided the engineer with a switch time, and other times he would instruct the engineer to input “your time.”

Toward the end of his shift on February 4, 2018, the conductor said that he forgot to report to the engineer when he handled two switches. After realizing that he forgot to communicate this information to the engineer, who was completing the SPAF, he reportedly told the engineer (p. 32, lines 6-8) “well, like I got it locked, you know, put in your time, you know, put it like a

minute apart." He said that normally (when not using EC1 authority), he did not have to report this information, and all that was required was that they reported back to the dispatcher when they were "all cleared up." The conductor said that neither he, nor the engineer, knew which milepost corresponded to each switch. He said (p.73, lines 18-21) "I mean, I didn't know what they were. I just knew -- I mean, I knew them because I looked in the timetable. But, you know, the minute you jump on the ground and you're throwing them, you're forgetting to report them." The conductor stated that it would be helpful if the number was written on or near the switch, as was typically the case in the dark territory he had worked.

Later in the shift, the conductor said that he entered the cab of the locomotive and looked at the SPAF. When he then called the dispatcher to release his EC1 authority, he described the process of reporting the numbers on the SPAF as follows (p.65, lines 1-6) "Because I just saw numbers and just said numbers: Saw a number, said a number; saw a number, said a number. And I didn't even think about it. You know, it could have been 1 in the morning and, you know, 5 in the afternoon. I wouldn't have known -- I couldn't -- I wasn't thinking about that. I was just saying the times as I saw them." He told investigators that, "the switch times and stuff was a mess." However, the conductor believed he had normalized all of the switches before giving up EC1 authority, and stated, "I knew I had it locked up, and that's all that really mattered in my mind, you know."

CSXT Post Accident Actions

CSXT TRANSPORTATION SIGNAL SUSPENSION

Operating Plan

Overview

Following recent incidents, the FRA has issued a proposed Safety Advisory to enhance safety when a railroad institutes a temporary signal suspension. The proposed Safety Advisory contains the following recommended best practices:

1. Ensure sufficient personnel are utilized to continue work until the system is restored.
2. If train traffic is allowed within the limits during the suspension a. Establish smallest possible limits

i. No more than three control points if possible

b. Minimize the duration of the signal suspension

i. No more than 12 hours if possible

c. Take measures to ensure only through traffic is allowed to operate
i. Avoid any movements that require the manipulation of switches

3. If switches are manipulated by hand, establish effective means of verifying that all switches have been returned to the proper position prior to any train traffic. Examples include:
a. Spiking or clamping with lock
b. Signal employee serving as switch tender
i. Establish process to ensure agreement between switch tender and train crew; and/or

c. Require first train through the limits (after switches have been operated) to proceed through the limits at Restricted Speed.

CSXT Signal Suspension Operating Plan

• Job briefings and oversight o Transportation crews receive job briefings before operating through limits Face to face with supervisor where possible, or
 Dedicated job briefing phone line manned by supervisors • Number for employees to contact supervisor provided on dispatcher messages.

 Foreign line employees • Job briefing by direct supervisors, or
• Job briefing by CSXT supervisors by one of the methods listed above

o Transportation supervisors will monitor train activity within limits to include operational testing
o Train dispatchers receive job briefing from operations center supervisors
o Operations center supervisors will monitor activity to include operational testing

• CSXT Signal Department will ensure: o Adequate staffing at work locations to complete planned work in timely manner
o Only necessary control points affected
o Once the train dispatcher authorize the signal suspension start, the signal department will place all switches on hand and secure every switch within the limits with a craft specific lock and red tag. The signal department will report the position of switches and the applied craft specific locks to the train dispatcher. Signal Department craft specific lock.

Operations center

- When train dispatcher authorizes a switch to be placed in a position other than normal, the dispatcher will apply a switch tag (electronic CAD's function) to the switch being used. Once the switch is restored to normal position (as verified by steps below), the dispatcher will remove the switch tag.
- Dispatcher turnover will consist of a thorough job briefing regarding the status of any switches that are in other than normal position.

- Train operations

- Industrial and other switching will be discontinued during signal suspension
- Planned train meets will occur outside of suspension limits
- Position of switches will be coordinated between train dispatchers and on-sight signal department employees
    - If switches are required to be operated for train route:
        - The train dispatcher will authorize the train crew or switch tender to operate the switch.
        - The train crew or switch tender will communicate with the signal department to unlock the switch. The crewmember or switch tender will line the switch for the train route.
        - The signal department verify switch is properly lined and secure the switch with a craft specific lock and red tag before the train movement
        - After the train movement is made, the switch will be restored by the train crew or switch tender and secured by the signal department using a craft specific lock and red tag.
        - The train crew or switch tender will report to the train dispatcher the switch has been restored, secured by the signal department, and communicate the SPAF requirements. Train Crew instructed to not pass location where switches were operated until confirming switch position with Switch Tender

- Once the train dispatcher authorizes the cancellation of the signal suspension, the signal department will place all switches on power and remove their craft specific locks, red tags and secure every switch within the limits with a transportation switch lock.

Conclusion

The operating plan as outlined above creates additional safety measures for signal suspensions. In addition to existing rules governing the use of hand operated switches, this plan incorporates the best practices outlined in the FRA Safety Advisory and provides redundant verification of switch position.

Appendix

401.Operating Switches and Derails by Hand

401.1 Employees are individually responsible for the switch in use and must not operate a switch or derail until qualified on operating and safety rules related to the operation of the device.

401.2 Before lining a switch or derail, the employee must ensure:

1. There are no conflicting movements;
2. Any preceding movement has passed the clearance point;
3. The device is not locked, clamped, spiked or tagged out of service; and
4. No obstructions will interfere with normal movement of the switch points or the handle.

401.3 Rolling equipment must not foul a track until it can be visually determined that:

1. Switches and derails connected with the movement are properly lined, and
2. The intended route is clear.

401.4 Do not unlock or operate a switch or derail that provides access to a controlled track unless Authorized by:

a. Verbal authority from the train dispatcher, or
b. Signal indication

401.5 Do not line a switch for a diverging movement for another train until contacting the approaching train and confirming the:

1. Train intends to make a diverging movement
2. Crew understands the switch will be lined for the diverging movement, and
3. Train will approach the switch prepared to stop.

401.6 If lock is determined to be defective or missing on a switch or derail that requires a lock, replace the lock. If lock is not readily available:

1. Report the device to the proper authority
2. Attend and protect the device until relieved by the proper authority

401.7 When an employee determines a switch or derail is defective , the employee must:

1. Not operate the device
2. Report the device to the proper authority, and
3. Tag the device as defective

401.8 After operating a switch or derail, the employee must make certain the:

1. Device is properly lined
2. Switch points fit properly
3. Target if equipped, corresponds to the position of the device,
4. Lever is latched, and
5. Device is locked, if equipped with a lock.

401.9 On main track, signaled track, or sidings:

1. The normal position for hand-operated switches is for movement on those tracks, and
2. The normal position for hand operated crossover switches is for straight away movement.

401.10 On other than main track, signaled track, or siding tracks:

1. Hand operated crossover switches must be in a corresponding position with both switches lined for the crossover movement or both switches lined for straight away movement.
2. The normal position for hand operated scale track switches is for movement away from the scale, and
3. Other hand operated switches have no normal position.

401.11 On all tracks, the normal position for derails is derailing position.

401.12 Line switches and derails for their designated normal position except when:

a. Changed for immediate movement, or
b. Being used during continuous switching operations, or
c. Attended by a qualified employee, or
d. Authorized by the train dispatcher

401.13 Restore switches and derails on controlled tracks to their normal position before:

a. The movement is reported clear to the train dispatcher, or
b. A signal to proceed is given to another train.

401.14 Before departing a location where main track switches have been operated by hand , each crewmember must verbally confirm the position of the switches and that they have been locked.

401.15 Properly line both switches of crossover for the movement before a train fouls the crossover. If the switch at one end of a crossover is changed properly line the switch at the other end of the crossover to avoid a conflicting route except when necessary for an employee to establish blue flag protection.

401.16 Complete the movement through a crossover before either switch is changed from a corresponding position except when one crew is using both tracks by the crossover during continuous switching operations.

End of Report

I have read and approve the Report

Tomas R Torres – Operations NTSB //s// 10/29/18

_____ Date _____

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NTSB

_____ Date _____

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