National Transportation Safety Board
Washington, D.C. 20594

Railroad Accident Brief

Accident No.:	DCA-13-FR-001
Location:	Niles, Michigan
Date:	October 21, 2012
Time:	10:10 a.m. eastern daylight time[1]
Train:	Amtrak (National Railroad Passenger Corporation) train 350
Property Damage:	$400,000
Fatalities:	0
Injuries:	13
Type of Accident:	Derailment

The Accident

On Sunday October 21, 2012, at 10:10 a.m. eastbound Amtrak (National Railroad Passenger Corporation) train 350, operating over the Amtrak Michigan Line (AML) in Niles, Michigan, entered the Niles Yard from the main track at Control Point (CP) 190 while traveling 61 mph. The train derailed about 291 feet after diverging from the main track and traveled 1,148 additional feet before coming to a stop on a yard track.

The train was composed of two locomotives, one on each end, and four passenger cars. All four cars and both locomotives derailed upright and in line with the track.

Event recorder data indicate that the train was traveling at 61 mph. Images from the locomotive outward-facing video showed that the train was proceeding on a clear[2] signal and that CP 190 power-operated switch #2 was aligned to route the train from the main track into Niles Yard. The track entering the yard was limited to 15 mph, and the track beyond was limited to 5 mph.

At the time of the accident, an Amtrak signal supervisor was at CP 190 engaged in maintenance activities involving the use of jumper wires.

On board the train were 165 passengers and 4 crewmembers. Emergency responders reported that 13 people were injured; 8 of those were transported to area hospitals. None of the injuries were reported to be life-threatening.

[1] The crew began their trip on central daylight time in Chicago, Illinois, and transitioned to eastern daylight time upon entering Indiana. Unless otherwise noted, the times shown in this report are in eastern daylight time.

[2] A *clear* signal is an indication that the tracks ahead are unoccupied and maximum speed is authorized. At CP 190, a clear signal is indicated by the display of a green aspect in the upper signal head.

Amtrak estimated the damage at $400,000.

The weather was clear, and the temperature was 52°F.

Train Director's Operational Plan

Amtrak train 350 operates eastbound daily between Chicago, Illinois, and Pontiac, Michigan. Train 351 operates westbound daily between Pontiac and Chicago. Trains 350 and 351 typically pass each other at Niles. However, on this day, train 351 was running late, and the train director[3] planned for the trains to meet and pass at Dowagiac, Michigan, the next passing siding track east of Niles, with train 350 routed into the siding. The train director planned to operate train 350 through CP 190 on the main track toward Dowagiac.

Amtrak Train 350

Amtrak train 350 departed Chicago at 7:21 a.m. central daylight time. The train continued to Porter, Indiana, where it entered the AML. Train 350 stopped at Niles Station to discharge and receive passengers shortly after passing an approach signal. This signal required train 350 to approach the next signal (CP 190) prepared to stop and to not exceed 30 mph.

Amtrak rules allowed train speed to be increased if the in-cab[4] display changed to a more favorable indication. Recorded data indicate that at 9:06:31 a.m. the eastbound signal at CP 190 was requested by the train director. At 9:06:41 a.m., the eastbound signal indicated the track was aligned for Amtrak train 350 movement and power-operated switches #1 and #2 indicated the route was locked and aligned normal. While the train was stopped at Niles, the CP 190 signal and the lead locomotive in-cab display[5] changed to clear. The engineer told investigators that while the train was stopped in the station, he heard the train director and a signal maintainer on the radio discussing CP 190 switch #2, and he noticed that the in-cab display changed from 30 mph to 110 mph.

The train departed Niles at 10:07 a.m. The clear signal on the in-cab display authorized train 350 to operate at the maximum track speed of 110 mph. However, the engineer stated he kept the train speed at 30 mph until the signal at CP 190 could be seen. When the engineer confirmed that the signal at CP 190 was displaying clear (green), he applied full throttle.

The engineer said when the locomotive reached CP 190 #2 switch, he felt a "hard jerk" and was thrown from his seat. The engineer said that when he got up and saw that the train was in the yard, he applied the emergency brakes. When the train stopped, he made an emergency radio call and remained on the locomotive until emergency responders took him to the hospital.

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[3] Referred to as a train dispatcher on some railroads.

[4] Amtrak's Incremental Train Control System (ITCS) included an in-cab display so engineers could see the real-time status of the signals affecting their trains.

[5] The AML signal system (described later in this report) provides information to the engineer on allowable speeds with an in-cab display.

Figure 1. Train 350 outward-facing video screen shot showing clear signal at CP 190.

Figure 2. Train 350 outward-facing video screen shot showing reversed switch #2 at CP 190.

Event recorder data indicate that after leaving Niles, the train speed remained under 30 mph for about 1/4 mile. At that point, the data show that the throttle position was increased to maximum and that train speed increased to 61 mph before emergency brakes were activated by the engineer at 10:09:51 a.m.

Preaccident Events

The last movement before the accident at CP 190 involved maintenance-of-way equipment. A track maintenance crew had been operating a tamping machine, and at the completion of their work, they contacted the train director and requested permission to move the tamper into Niles Yard. The train director attempted to align CP 190 switch #2 into the reverse position but was unable to do so.[6] The switch showed out of correspondence[7] on the train director's information display at 9:17 a.m.

The train director telephoned the AML signal supervisor at 9:18 a.m. and informed him of the switch problem. The train director also informed him that train 350 was at New Buffalo, Michigan, and that it was scheduled to depart Niles at 10:07 a.m. At 9:25 a.m. the signal supervisor notified the train director that he was unable to reach a signal maintainer to respond and that he was en route to CP 190 himself.

At 9:55 a.m., the signal supervisor arrived at CP 190. He said that he first attempted to correct the problem at the power-operated switch machine but was unsuccessful. He said that he entered the signal bungalow and removed two cartridge fuses, opened two terminal nuts on the terminal board, and applied local battery power using two jumper wires. The signal supervisor stated that when the battery power was applied, the local control panel indication lights showed that the #2 switch was aligned and locked normal.[8] The signal supervisor stated that he did not verify the physical position of the #2 switch before applying the jumper wire.

The train director contacted the signal supervisor on the radio and informed him that the #2 switch was now indicating normal on the display and asked if everything was safe for train 350 to proceed eastward. The signal supervisor told the train director that the switch was good for the normal movement. The conversation concluded at 10:10 a.m. as Amtrak train 350 approached CP 190. The signal supervisor said that he observed train 350 approaching CP 190. He said that as the train entered the yard tracks, he realized what had occurred, and he then removed the jumper wires and reinstalled the cartridge fuses. The signal supervisor did not notify anyone at this time that he had used jumper wires just before the derailment, and he did not leave the signal bungalow to aid the passengers and crew on the derailed train.

When he was interviewed on the day after the accident, the signal supervisor told investigators that there was nothing pressing on his mind as far as his home or work life. In a subsequent written statement provided to Amtrak, the supervisor indicated that a family event was planned later on the day of the accident and that he was upset at being called away to attend to a problem on the railroad that might interfere.

Amtrak Signal Supervisor

The signal supervisor was hired in 1975 by the Penn Central Railroad. He worked 8 years as assistant signalman, signalman, and signal maintainer. In 1983 he began his career with Amtrak where he worked as assistant signalman, signalman, and signal maintainer. In 1984, he was promoted to signal supervisor. He was temporarily furloughed in 1986. He returned to Amtrak as a signal maintainer and worked in that position from 1987 to 1992. He was again promoted to signal supervisor and remained in that position until the date of the derailment.

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[6] Track switches have two positions: normal and reverse. At CP 190 normal was straight through on the main track, and reverse was diverging from the main track.

[7] The term *out of correspondence* means that the signal system cannot detect the position of the switch.

[8] The fuses were from locations BC45 and BC41. They were the inline fuses protecting the BX110 and NX110 circuits to the power-operated switch machine.

The signal supervisor described his work/sleep/wake history as working from 7:00 a.m. to 3:30 p.m. on Friday (October 19) performing office work and field work. He returned home at 4:00 p.m. and retired for the night at about 8:00 p.m. On Saturday (October 20), he awoke about 5:30 a.m. and remained near his home performing chores. He was called by the train director about 10:30 a.m. on a signal system problem elsewhere in the AML. The signal supervisor finished debriefing with the signal maintainer about 1:30 p.m. He retired for the night around 10:30 p.m. On Sunday (October 21), he awoke about 7:00 a.m. and remained near his home performing chores until he was called by the train director about the #2 power-operated switch near Niles.

Amtrak Signal System Trouble Call Procedures

When signal system malfunctions occurred on Amtrak, they were reported to the trouble desk, and field crews were notified and dispatched by the trouble desk as appropriate on Amtrak territories that have a maintenance trouble desk in the train director's office. The AML did not have a maintenance trouble desk in the train director's office. The procedure for handling signal system trouble reports on the AML was described by the Amtrak division engineer as follows:

> All signal malfunction reports received after normal working hours on Monday through Friday [were] forwarded to the signal supervisor and he [assigned] signal personnel to respond.

The CP 190 signal problem occurred on a weekend, therefore the train director contacted the signal supervisor directly.

The signal supervisor indicated that on the date of the accident, he was unable to reach any of the maintenance staff to respond, so he responded instead. He stated it was not unusual for him to respond and sometimes troubleshoot a signal malfunction.

He could not provide any statistics on the frequency of his personally responding and resolving trouble calls, and he explained that he would often respond to trouble calls

> … to supervise and support the people that are out there. And on occasions that a response is not obtained (signal maintenance personnel are not available) and the operation is suffering, is in need of, you know, someone out there, I don't hesitate. I go.

When investigators requested the hours-of-service[9] records for the signal supervisor, Amtrak responded that despite a comprehensive search of his office and computer, it was unable to produce a record of hours-of-service reports for the signal supervisor.

After the accident, Amtrak revised the signal system trouble call-out procedure. The revised procedure is discussed in the Postaccident Actions section of this report.

[9] Railroad employees who perform work on signal systems must conform to Federal Railroad Administration (FRA) hours-of-service regulations, and Amtrak was required to maintain records on hours worked. Had hours-of-service records been available for the supervisor, they would have provided information on the frequency of his performing maintenance work.

Accident Location and Site Description

Accident Site Information

The AML main track passes through Niles in a geographic northeast/southwest direction. Niles Station, located about 1 1/2 miles southwest of the derailment site, is an Amtrak passenger station served by four passenger trains in each direction daily.

Amtrak Track and Signal System

The AML in the vicinity of the accident consists predominantly of single main track territory. The track structure was designated as class 6 track[10] in accordance with Federal Railroad Administration (FRA) regulations and had numerous controlled passing tracks. Operations on the line were regulated by the *General Code of Operating Rules,* Amtrak general orders, timetable instructions, Amtrak system special instructions, and the signal indications of the traffic control signal system. The train director coordinated train movements from the Amtrak control center in Chicago, Illinois.

Railroad operations in the accident area were conducted on a single main track signaled for bidirectional movement. The maximum authorized speed for passenger trains at CP 190 was 110 mph.

CP 190 was a combination of wayside signals, power-operated switches, and turnouts that allowed the train director to route trains into and out of Niles siding and into and out of Niles Yard. Train movements were authorized by the signal indications of a traffic control signal (TCS) system. Intermediate automatic block signals were located at intervals between control points and provided indications to engineers on the status of signal blocks ahead and speed requirements. Signal indications were also displayed in the locomotive cab.

The Amtrak Incremental Train Control System (ITCS), an overlay positive train control system, was interconnected with the TCS system and also with equipment on board each locomotive. The ITCS enforced all speed and stop requirements and consisted of three main segments. The wayside equipment segment consisted of wayside interface units at each control point, intermediate signals, and electrically locked hand-operated switches. The wayside interface units monitored switch position, track circuit occupancy, and signal aspects displayed by the TCS.

The communication segment consisted of a wide local area network that connected the wayside interface units to wayside servers and broadcasted data messages to trains. The wayside servers contained a track database for the territory that included maximum authorized speeds and speed restrictions. Communication between the wayside servers and the control center allowed the train director to issue or void temporary speed restrictions to the track database.

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[10] Railroads determine how they will classify various segments of their track. As the class designation number increases, the track must meet increasingly higher federal standards for construction, maintenance, and inspection. Federal regulations also establish maximum train speeds for each class of track. Class 6 track is rated for 110 mph.

The locomotive segment consisted of an on-board computer and an in-cab display. The in-cab display continuously displayed the maximum authorized speed, actual speed, distance to targets,[11] type of target, and target speeds. The on-board computer contained a database of signal indications, track curvature, gradients, mileposts, speed limits, speed restrictions, and the locations of all devices linked to it. The on-board computer continuously calculated braking distances to targets, monitored current speed and upcoming speed requirements, and initiated a full-service brake application if the maximum authorized speed was violated or the train was not properly slowed for an upcoming speed restriction or requirement to stop.

The Investigation

Field Inspection and Testing

The Amtrak locomotive received a predeparture inspection, and the train had an initial terminal air brake test before departing Chicago Union Station. No defects were noted. Investigators inspected the train after the collision and noted no defects other than postaccident damage. The locomotive engineer told investigators that he did not experience any problems with the equipment or with the braking system.

Investigators inspected the track and reviewed track maintenance records; they noted no anomalies.

The outward-facing video recorder on board the locomotive was downloaded and reviewed. The video indicated that Amtrak 350 was operating on a clear signal as it was approaching CP 190. The video also showed that CP 190 switch #2 was aligned reverse (toward the yard).

The inspection of the wayside equipment found all signal units and cases secured with no evidence of vandalism. Inspection and tests of the #2 power-operated switch machine determined the switch point detector was latched out.[12] The switch point detector latched out when the train director attempted to align the switch to the reverse position for the track maintenance crew earlier on the day of the derailment. With the switch machine point detector latched out, the train director received an out-of-correspondence indication for that switch.

Amtrak configured the power-operated switch machines on the AML so that they needed to be reset manually by signal personnel whenever a switch was latched out. Inspection of the #2 switch determined that the reset push button for the hand crank had been triggered. The push button, on the outside of the switch machine case under the cover where the hand crank was inserted, was triggered whenever the hand crank was inserted. When the push button was triggered, all power to the switch machine was removed to prevent the switch machine from moving while maintenance personnel used the hand crank to avoid possible injuries.

[11] *Targets* refer to locations where the train must stop or change speed.

[12] A *latch out* is a mechanical safety feature on a dual-control switch machine that opens the indication contacts within the switch machine under certain conditions to prevent the switch machine from indicating to the signal system that it is lined normal or reverse. These conditions include an obstruction between the switch point rails and the stock rail and when the motor protection circuit times out because the motor is unable to move the switch point rails far enough as happened in this accident.

The inspection of the signal bungalow at CP 190 found all equipment was functioning as designed. However, two test nuts on the terminal board inside the signal bungalow had been opened.[13] These two test nuts were part of the #2 power-operated switch machine's normal indication circuit. This was a vital circuit in the signal system that was used to indicate the position of the switch machine.

On October 22, 2012, NTSB investigators interviewed the Amtrak signal supervisor who had been performing maintenance activities at CP 190 just before the derailment. The signal supervisor said that he could not fix the out-of-correspondence switch at CP 190 before the train arrived. He said that his intention was to lock the switch in the proper position and allow the train to proceed without delay.

The signal supervisor said he observed the #2 switch aligned reverse when he first arrived at CP 190. He made an unsuccessful attempt to resolve the problem at the switch machine by inserting and removing the hand crank. He then went into the signal bungalow and removed the cartridge fuses to prevent the switch from automatically moving while the train approached. He did not verify visually that the switch was aligned to the normal position before he removed the cartridge fuses. He then attached jumper wires to bypass the circuit and provide electricity directly to the #2 normal switch repeater relay. The signal supervisor said he did not observe which request relay was energized. The application of jumper wires caused the signal system to falsely indicate that the #2 power-operated switch machine was aligned and locked in the normal position (for straight through movement). When the #2 switch indicated it was aligned normal, the train director requested a clear signal at CP 190. Event recorder data show that the wayside signal system equipment at CP 190 responded to the request by displaying a clear signal.

Exclusions

This section addresses those elements of the investigation that the NTSB determined were not factors in the accident. Neither the condition of the track nor the condition of the train contributed to the accident. The weather and the visibility of the signals did not contribute to the accident.

The Amtrak train crew was trained and qualified. The actions of the train crew did not contribute to the accident. The signal supervisor's performance was not affected by medical conditions, and he was not fatigued at the time of the accident. The Amtrak train engineer, the Amtrak train director, and the Amtrak supervisor were not using portable electronic devices and were not distracted.

The train director and the signal supervisor were subject to postaccident toxicological testing for illegal drugs and alcohol. All results were negative. Federal regulations did not require the train crew to be toxicologically tested.

[13] The two test nuts, also called gold nuts, had been loosened, which electrically opened the signal circuits into which they were wired.

Amtrak Training

Amtrak training records indicated that signal maintenance staff received training on AMT 23, *Special Instructions Governing Construction and Maintenance of Signals and Interlockings*, every 2 years. Signal maintenance staff had also attended manufacturer-provided hands-on training on the GrandMaster 4000A switch machine in June 2011.[14]

The signal supervisor's personnel records indicated he attended training on *Operating Rules for Engineering Department* in June 2012. He was qualified on *Roadway Worker Protection*, and had taken a refresher course in July 2012. In addition, his training records indicated that in August 2011 he attended a review course for the Amtrak *Communications and Signal Manual*, *Special Instructions Governing Construction and Maintenance of Signals and Interlockings* (AMT 23), and *Instructions for Testing Signal Apparatus and Signal Systems* (AMT 27). His records also indicated he attended field hands-on training on the switch machine in June 2011.

Amtrak Signal Maintenance Oversight

Jumper wires are sometimes used on railroad signal systems and highway-rail grade crossing warning systems during maintenance or construction activities for troubleshooting and to temporarily disable crossing warning systems while the track is out of service for maintenance. Because jumper wires can bypass or deactivate safety-critical systems, their use must be managed and controlled through detailed written procedures.

AMT 23 contained the procedures for the use of jumper wires on the AML at the time of the accident. AMT 23 required that a manager approve the use of jumper wires before they were used and "every attempt to correct the situation by other means should be made" before jumper wire use was authorized. After a manager had authorized the use of jumper wires, AMT 23 required the entry into a log kept by the trouble desk of information including who authorized the jumper use and who was authorized to apply the jumpers, what alternative protection was provided, and confirmation that the train director was notified.

In this accident, the supervisor did not notify the train director that jumper wires were being used and did not implement alternative means of protection.

On territories such as the AML where there was no trouble desk, AMT 23 required that the assistant division engineer for communications and signals (C&S), or the signal employee in charge, submit a plan to the deputy chief engineer for C&S for approval of proposed procedures to control jumper wire use and for logging permission to use jumper wires. Investigators asked Amtrak to supply copies of the AML plan and logbook that were in use at the time of the accident. However, Amtrak was unable to provide these items. The AML assistant division engineer for C&S said that he had seen the signal supervisor make entries in a jumper log several months before the accident. He also said that the log form and the rules in AMT 23 constituted the plan for managing jumper wire use on the AML at the time of the accident.

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[14] The #2 power-operated switch machine installed at CP 190 was a GrandMaster 4000A.

Amtrak also installed jumper keeper devices in communications and signals maintenance trucks to store jumper wires and alert the driver when a jumper wire has not been returned to the keeper box. When a jumper wire is removed from the jumper keeper and the vehicle ignition is turned on, an alarm sounds to alert the driver that a jumper has not been returned to the storage rack. Amtrak officials explained that the jumper keeper minimizes the likelihood that a signal maintainer will inadvertently leave a jumper installed. When the truck assigned to the signal supervisor was inspected a few days after the accident, the jumper keeper device was not in place, and the jumper wires were in the glove compartment. Amtrak officials stated that the supervisor had received a replacement vehicle in July 2012, and for undetermined reasons he had not had the jumper keeper reinstalled.

Amtrak Total Efficiency Safety Tests System

Amtrak uses an operational tests and inspections[15] program to monitor compliance with operating rules and procedures. In this program, supervisors observe employee job performance and document compliance or noncompliance with specific procedures. Amtrak describes the purpose of the program as follows:[16]

> Efficiency tests are intended to enhance railroad safety by serving as a feedback mechanism between supervisors and the employees they supervise. Their purpose is to make employees promptly aware of proper and improper job behaviors, and enable the supervisor to take immediate action to correct improper behaviors.

The program has several guidelines for testing managers to maintain the quality of operational testing. These include spreading tests over all days of the week, conducting at least half of the tests away from a crew base, and avoiding a pattern of repeating a limited number of tests. However, investigators noted that there were no tests to verify the proper use of jumper wires on signal equipment.

NTSB investigators examined the supervisor’s test records for the 24 months before the accident. The supervisor was observed for rules compliance by his manager 40 times. Thirty-six (90 percent) of the test observations were shown as being conducted at the Niles Yard. Twenty-six of the observations (65 percent) were recorded as related to roadway worker protection job briefings. All test results were recorded as in compliance.

Amtrak also provided the test results for 11 AML signal maintenance staff. The records contained 392 test observations on eight test subject areas. All test observations were recorded as in compliance, and 289 (74 percent) were conducted at Niles Yard. Two hundred sixty (66 percent) of the observations were related to job briefings.

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[15] Often referred to as efficiency tests.
[16] *A Supervisor’s Guide to T.E.S.T.S.* November 7, 2011.

Postaccident Actions

Amtrak Actions

Amtrak Safety Stand Down

On October 26, 2012, Amtrak issued a safety notice and conducted a systemwide safety stand down for signal maintenance personnel. Amtrak managers discussed the circumstances of the Niles derailment and reviewed proper jumper wire procedures at safety meetings throughout the system.

Amtrak Bulletin on Jumper Procedures

On March 18, 2013, Amtrak issued Bulletin CEN-001, *Procedures for the Application of Jumpers, Amtrak–Michigan Line*. The bulletin lists the procedures specified in Amtrak Communications and Signals Manual, AMT 23, Section 8: *Relays, Circuit Controllers and Use of Jumpers,* for territories that do not have a trouble desk. The procedures explain that jumper wires should only be used as a last resort to restore train operations. The procedure requires the train director or operator to be notified in all cases in which any signal system is inoperative and how protection is provided until repairs are made and the jumper wires are removed. It further requires the signal employee to obtain permission from the assistant division engineer for C&S or the signal supervisor for C&S in charge of the territory. The assistant division engineer or the signal supervisor must then obtain approval from the division engineer or the deputy division engineer. A jumper permission form must be prepared and signed by the employee requesting the jumper, approved by the employee authorizing the jumper, and retained for 30 days.

Amtrak T.E.S.T.S. Observation Program

After the accident, Amtrak revised its T.E.S.T.S. observation program for signal maintenance activities to include a variety of safety-sensitive behaviors and to emphasize that the focus of audits must be in the field, away from headquarters. Amtrak stated that it had increased overall field observations by 20 percent and that managers/supervisors will observe employees in the field using rules associated with the tasks they are given for that particular day and job. Observation locations will be listed by milepost number rather than by the nearest station.

Amtrak Revised Signal System Trouble Call Procedures

After the derailment, Amtrak instituted changes to the handling and assignment of signal malfunction reports. The assistant superintendent of train movement in the Chicago control center described the revised procedure as follows:

> The requirement for the train directors in the Chicago control center during [the] first (6:00 a.m. to 2:00 p.m.) and second (2:00 p.m. to 10:00 p.m.) shifts on weekdays [is] to notify signal maintenance personnel on the assigned territory about trouble calls via the Chicago control center trouble desk tech who will manage calls directly to field personnel. During [the] third shift on weekdays

> (11:00 p.m. to 7:00 a.m.) and on Saturdays and Sundays, electronic technicians also assigned to the Chicago control center … notify and assign trouble calls to the signal maintenance personnel.

NTSB Actions

On March 8, 2013, the NTSB issued safety recommendations to the Federal Transit Administration (FTA) and the FRA:

<u>To the FTA:</u>

> In coordination with the Federal Railroad Administration: evaluate the best practices outlined in the Federal Railroad Administration's Safety Advisory 2002-01, and issue an updated safety advisory to all rail transit agencies that (1) advises them of the circumstances of the Miami, Florida; Madison, Illinois; and Niles, Michigan accidents involving signal system maintenance procedures and (2) highlights the importance of adhering to the specified industry best practices regarding the use of jumper wires. (R-13-1)
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> Instruct state safety oversight agencies to audit all rail transit agency procedures and maintenance oversight programs regarding the use of jumper wires to ensure they incorporate the current best industry practices outlined in the revised Safety Advisory recommended in Safety Recommendation R-13-1 and that transit procedures comply with Title 49 *Code of Federal Regulations* sections 236.4 and 234.209. (R-13-2)

<u>To the FRA:</u>

> Reissue the best practices outlined in your Safety Advisory 2002-01, as part of an updated safety advisory that: (1) advises all railroads of the circumstances of the Madison, Illinois and Niles, Michigan accidents involving signal system maintenance procedures, and (2) highlights the importance of adhering to the specified industry best practices regarding the use of jumper wires. (R-13-3)
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> Audit all railroad procedures and maintenance oversight programs regarding the use of jumper wires to ensure they incorporate the current best industry practices outlined in the revised Safety Advisory recommended in Safety Recommendation R-13-3 and ensure that railroad procedures comply with Title 49 *Code of Federal Regulations* (CFR) sections 236.4 and 234.209. (R-13-4)

Federal Actions

On June 3, 2013, the FRA issued Safety Advisory 2013-04, Importance of Clear Safety Procedures for Temporary Removal from Service of Highway-Rail Grade Crossing Warning Systems and Wayside Signal Systems.[17] The safety advisory referenced the two NTSB accident

[17] *Federal Register* 78, no. 106 (June 3, 2013): 33146-33148.

investigations and reemphasized the importance of ensuring the safety of the traveling public and railroad employees when highway-rail grade crossing warning systems and wayside signal systems are temporarily removed from service for the purpose of testing, inspection, maintenance, or repair. The safety advisory contained recommended actions for railroads to follow to ensure safety.

On July 2, 2013, the FTA issued a safety advisory to address the NTSB recommendations. The safety advisory recommended that rail transit agencies review their current maintenance programs to ensure they were in agreement with FRA Safety Advisory 2002-01. The FTA further recommended that rail transit agencies should at a minimum assess how jumper wires are used in the signal maintenance program; establish policies and procedures agencywide for the proper temporary deactivation of wayside train signal systems, highway-rail grade crossing warning systems, and other devices; and establish training for all affected employees to ensure they understand the instructions. The safety advisory also recommended that state safety oversight agencies meet with the rail transit agencies to review the safety advisory and incorporate a review of the jumper wire procedures as part of the Three-Year Safety Review.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the unauthorized use of a jumper wire that provided a false proceed signal with a mainline switch lined to Niles Yard. The use of the jumper wire was inconsistent with Amtrak procedures for using jumper wires to override signal and train control safety-critical circuits. Contributing to the accident was the inadequate oversight by Amtrak management to ensure proper jumper wire safeguards were employed.

Adopted: November 20, 2013