



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: May 24, 2012

In reply refer to: R-12-27 through -29
R-05-14 (Reclassification)

The Honorable Joseph C. Szabo
Administrator
Federal Railroad Administration
Washington, D.C. 20590

On July 14, 2009, about 2:08 a.m., central daylight time,¹ Dakota, Minnesota & Eastern Railroad (DME)² freight train B61-13, consisting of two locomotives and 83 railcars, was operating southbound³ under track warrant authority⁴ in non-sigaled territory on the main track when it went into Bettendorf Yard via the misaligned north yard hand-operated switch.⁵ Event recorder data showed that the train was operating at 25 mph before the DME train's engineer activated the emergency brakes as the train entered the yard. However, the braking action was only able to slow the train to about 21 mph before it struck 19 loaded railcars on yard track No. 3, derailing 4 of those railcars, in addition to derailing 9 railcars and the 2 locomotives on the DME train. The engineer and the conductor on DME train B61-13 sustained fatal injuries. The north yard hand-operated switch had been left incorrectly lined from the main track onto the yard track by the crew of BNSF Railway local train RCHI4274-13I (BNSF local).

The collision occurred on the DME Davenport Subdivision, near milepost (MP) 187.8 in Bettendorf, Iowa. Train movements were authorized by track warrants issued by a DME train dispatcher⁶ located in Sioux Falls, South Dakota. The maximum authorized speed for the

¹ In this report, all times are central daylight time.

² Dakota, Minnesota & Eastern Railroad is a subsidiary of Canadian Pacific (CP) Railway.

³ DME timetable directions are listed as "northbound" and "southbound," which are geographically west or east, respectively, at Bettendorf, Iowa.

⁴ *Track warrants* are authorizations issued by a dispatcher for a train to occupy a certain segment of track for a certain period of time. The track warrant authority is obtained and released through communication between train crews and the dispatchers.

⁵ A *hand-operated switch* means any type of switch operated by manual manipulation. Under Title 49 *Code of Federal Regulations* (CFR) Section 218.93, "a hand-operated switch does not include switches operated by push button or radio control when such switch is protected by distant switch indicators, switch point indicators, or other visual or audio verification that the switch points are lined for the intended route and fit properly."

⁶ DME also refers to train dispatchers as operations supervisors.

main track in the Bettendorf area was 25 mph. There was no signal system to govern train movements or convey information regarding the north yard hand-operated switch position.⁷

The NTSB determined that the probable cause of the accident was the BNSF Railway local train RCHI4274-13I crew releasing track warrant authority before returning the north yard hand-operated switch to the correct position. Contributing to the accident was the dispatcher for DME, granting track warrant authority to DME train B61-13 without holding a job briefing, which would confirm the accurate positions of all applicable main track switches. Also contributing to the accident was a hand-operated switch position reflector target that could not be observed by the crew of train B61-13 at a sufficient distance to stop the train and avoid the accident.

Events Preceding the Accident

The BNSF local departed Barstow, Illinois about 8:05 p.m. on July 13, 2009, with two locomotives and 137 mixed freight railcars. En route, the BNSF local made two stops to set out 80 railcars before proceeding north (timetable direction) onto the DME railroad with the remaining 57 railcars, destined for the north end of Bettendorf Yard. After passing at the north end of the yard, about 12:15 a.m. on July 14, 2009, the conductor lined the north yard hand-operated switch to enter the yard. This switch is the only access to the north end of Bettendorf Yard. Prior to the BNSF local's arrival at Bettendorf Yard, yard track No. 2, yard track No. 3, and the north siding were empty.

About 1:39 a.m., the crew of the BNSF local placed 20 railcars on yard track No. 2 and 19 railcars on yard track No. 3. The DME dispatcher then instructed the BNSF local engineer to clear the remainder of the train off the main track for a DME train to arrive. The BNSF local engineer requested permission to clear on the north siding. The DME dispatcher authorized the request. The BNSF local moved north about 350 feet with 18 railcars, past the remote-controlled north siding switch and the 31st Street crossing. The engineer successfully lined the remote-controlled north siding switch⁸ and backed the train onto the north siding.

After the BNSF local completed its movement onto the north siding, the remote-controlled north siding switch automatically lined itself back for the main track. However, the north yard hand-operated switch remained lined toward yard track No. 3. The BNSF local conductor walked to the front of the locomotive, met the brakeman at the front of the train, and boarded the locomotive. At 1:54 a.m., the conductor of the BNSF local released its track warrant authority to the DME dispatcher. While waiting 11 minutes for the DME train to pass, the BNSF local crew conducted a job briefing to discuss the remainder of the work. Neither the BNSF engineer nor the conductor discussed the north yard hand-operated switch that had

⁷ *Collision of Dakota, Minnesota & Eastern Railroad Freight Train and 19 Stationary Railcars, Bettendorf, Iowa, July 14, 2009*, Railroad Accident Report NTSB/RAR 12/03 (Washington, D.C.: National Transportation Safety Board, 2012). <<http://www.nts.gov>>.

⁸ The remote-controlled north siding switch at Bettendorf Yard was a power-operated switch that was to automatically normalize after a train completed its movement. This switch was lined when the engineer from the BNSF local entered a radio code requesting that the switch be operated. A wayside switch position indicator light then illuminated for that switch only after sending a radio transmission to the BNSF local engineer that the remote-controlled north siding switch was lined.

been used and they did not follow up or confirm the position of that switch among themselves or with the DME dispatcher.

The BNSF local crewmembers cleared the main track at the north siding, just past the north siding switch. At this point, the BNSF local crew had ample opportunity to perform a thorough job briefing to follow up on earlier tasks which would include verifying the position of the north yard hand-operated switch and would also provide an opportunity to correct the position of that switch before releasing track warrant authority.

Job Briefings

DME General Order No. A-14 is a DME supplement to the *General Code of Operating Rules* (GCOR), including rules 1.48, 8.3, and 14.7.1. This order, which was effective at the time of the accident, requires that a job briefing, at a minimum, define the work to be done, how the work will be done, identify the potential hazards, name the employees responsible for each task, and include a follow-up job briefing to ascertain all required tasks of the job are complete. The job briefing requirement is general in nature and does not address communication between a train crew and a dispatcher. BNSF rules require such communication between train crews and the dispatcher to confirm switch positions for trains operating on BNSF trackage. These rules did not apply on the DME trackage. BNSF rules did require its crews to maintain a switch position awareness form (SPAF) on both BNSF and other railroads.⁹ The conductor did not complete the SPAF prior to releasing the track warrant authority. However, crews were not required to confirm switch positions with dispatchers on other railroads.

Additionally, DME rules 8.3 and 14.7 require that all main track switches be lined and locked for main track movement before releasing track warrant authority. The north yard hand-operated switch leading into Bettendorf Yard should have been lined for main track movement before the BNSF local train crew released the track warrant authority and reported the train clear of the main track. The crew of the BNSF local failed to follow this critical operating rule. The conductor, the engineer, and the brakeman said they conducted a job briefing; however, they discussed future work in this briefing and failed to address relining the north yard hand-operated switch. The BNSF local's crew released its track warrant authority to the DME dispatcher without lining and locking the switch for main track movement, thereby allowing the DME dispatcher, who was unaware of the position of the north yard hand-operated switch, to issue a track warrant to the DME train.

The BNSF Chicago division general manager told investigators that train crews who operate on BNSF tracks are required to conduct job briefings with each other and with the BNSF dispatcher when releasing a track warrant authority on a main track in non-signaled territory, both at hand-operated and remote-controlled switch locations. This requirement was put in a System Special Instruction on July 16, 2008, and is now found in Rule 14.10 in the BNSF supplement to the sixth edition of the GCOR, effective April 7, 2010.

⁹ *Switch position awareness form* is a term used in Federal Railroad Administration (FRA) Emergency Order No. 24 (EO 24). The requirement to fill out these forms was deleted from FRA regulations before this accident; however, BNSF still uses the form.

DME's Executive Vice President of Operations told NTSB investigators that DME does not require a SPAF. In addition, when a train crew reports clear of the main track in a remote-controlled siding switch on DME trackage, crews are not required by either DME rules or FRA regulations to have a job briefing with the DME dispatcher, as is required when releasing track authority at a hand-operated switch.

According to the DME Executive Vice President of Operations, DME used not only the GCOR operating rules, but also an additional DME supplement to the fifth edition of the GCOR rules. This document (known as DME Supplement) was issued on June 13, 2009.

The DME GCOR supplemental rules are consistent with FRA regulations, which require crewmembers in non-signalized territory, unless specifically directed otherwise by a dispatcher, to report that hand-operated switches used to clear a train from the main track (but not remote-controlled switches) have been restored to their correct positions and locked. This report is to be made only after a job briefing has been conducted between the train crew and the dispatcher. The dispatcher must repeat the reported hand-operated switch position to the crewmember and ask for confirmation from the crewmember that the information is correct.

Because the BNSF local crew cleared the train from the main track at a remote-controlled switch, the requirement for confirmation of switch positions by the DME dispatcher did not apply to the remote-controlled north siding switch.

Job briefings are required for certain critical tasks in accordance with Title 49 *Code of Federal Regulations* (CFR) Section 218.103(b)(1): (1) before the work begins, (2) each time a work plan is changed, and (3) at the completion of the work. Such job briefings ensure that crewmembers working together understand the tasks they are intending to perform and exactly what is expected of them and their colleagues.

The NTSB concludes that had the BNSF local train crew been required to hold a job briefing with the DME dispatcher to confirm all applicable main track switch positions before releasing track warrant authority, it is likely the north yard hand-operated switch would not have been left lined for yard track No. 3.

In cases where a train crew clears a train from a main track at a remote-controlled switch location in non-signalized territory and contacts a dispatcher to release a track warrant, the dispatcher is not required by either DME operating rules or FRA regulations to have a job briefing with the crew to discuss the position of applicable switches.

The circumstances of the Bettendorf accident show that current FRA regulations could allow a situation in non-signalized territory in which a train dispatcher grants track warrant authority without having to confirm with a train crew that all previously used switches in the limits of the track authority were restored to their correct positions. The NTSB concludes that the FRA's decision to discontinue the EO 24 requirement that employees releasing track warrant authority report to the train dispatcher that all hand-operated main track switches have been restored reduces the safety of train operations on non-signalized main tracks.

The NTSB recommends that the FRA revise 49 CFR 218.105(d)(1) to require that, until the appropriate switch position technology is installed on main track switches in non-signalized territories that are not equipped with positive train control, train crews releasing track authority to the dispatcher must hold job briefings with the dispatcher and clearly convey the position of all main track switches that were used prior to releasing track warrant authority.

Switch Position Technology

Shortly before the accident, the DME dispatcher contacted the DME train and issued track warrant authority from the train's location at MP 185.0 to Nahant at MP 195.7 (south of Bettendorf Yard). The track warrant was effective at 1:57 a.m. Locomotive event recorder data showed that the DME train started moving southward almost immediately. Under DME operating rules, the track warrant authority gave the DME train sole main track occupancy authority, conveying assurance that all switches were lined and locked for main track train movement at the maximum authorized speed. After receiving track warrant authority, the DME engineer keyed in a radio code requesting confirmation that the remote-controlled north siding switch at Bettendorf was lined to the correct position. The remote-controlled north siding switch activated an audible communication to the DME engineer and displayed a green switch position indicator light, indicating that it was lined and locked for main track movement.

At MP 187.68, the switch position indicator light showed the position of the remote-controlled north siding switch. Postaccident sight-distance testing revealed the switch position indicator light was green and first visible from MP 187.2. Although red reflections from the north yard hand-operated switch position reflector target¹⁰ were visible from 33rd Street, it was not readily identifiable as the target for the north yard hand-operated switch until 31st Street.¹¹ At MP 187.7, the north yard hand-operated switch was incorrectly lined leading into the yard. The DME train entered the yard, traveled 168 feet, and struck 19 stationary cars on track No. 3.

The NTSB concludes that the switch position reflector target for the north yard hand-operated switch did not adequately warn the approaching train of the incorrectly lined main track switch at a sufficient distance for the train to stop in time to prevent the accident.

The DME train passed the remote-controlled north siding switch, which was lined in the correct position for main track movement. Then, almost immediately, the train diverted from the main track at the incorrectly lined north yard hand-operated switch.

The brakeman on the BNSF local told investigators that as the DME train was approaching Bettendorf Yard, he observed that the DME train's locomotive headlight was illuminated as it approached 31st Street, which was about 210 feet north of the incorrectly lined north yard hand-operated switch, that was equipped with a reflective target.

¹⁰ *Switch position reflector targets* are reflectorized metal flag-like devices that are connected to switch stands. On main track hand-operated switches, the target will be green if the switch is lined normally for the main track and will be red otherwise. There are currently no specific Federal regulations concerning switch targets.

¹¹ The distance from the north yard hand-operated switch to 31st Street is approximately 210 feet.

The DME Davenport Subdivision is in non-signaled territory. Remote-controlled switches at passing tracks are equipped with “switch position indicators,” which only convey switch positions, not track occupancy. Train movements are authorized by track warrants issued by the DME dispatcher. GCOR Rule 2.14 requires the use of track warrants in non-signaled territory. The rule also contains procedures intended to ensure train crews understand the directives. DME’s operating rule 1.48¹² also requires that all main track switches be lined and locked for main track movement.

The NTSB concludes that the accident highlights the need for measures to ensure safety redundancy that is greater than those provided by current rules or regulations. Train dispatchers must have assurance that the track ahead of train movements in non-signaled territory is clear of other trains or equipment and that switches are in their correct positions before track warrant authorities are issued to trains. Therefore, the NTSB recommends that the FRA require railroads to install, along main lines in non-signaled territory not equipped with positive train control, appropriate technology that warns approaching trains of incorrectly lined main track switches sufficiently in advance to permit stopping. Because this recommendation expands upon and reinforces the intent of Safety Recommendation R-05-14, that recommendation is reclassified “Closed—Superseded.”

Authorized Speed

After exiting the last curve, the DME train continued southward on straight track for about 2,600 feet before passing the switch position indicator light at the remote-controlled north siding switch at Bettendorf Yard.¹³ The DME engineer made no changes to the throttle approaching the accident location.

NTSB investigators reviewed event recorder data, which showed that the DME train was operating at the authorized 25 mph main track speed when the DME train’s engineer activated the emergency brakes. The train slowed to about 21 mph at impact, which was when the event recorder stopped recording. The NTSB concludes that the actions of the DME train crew were appropriate and in compliance with the track warrant authority and track speed limits at the time of the accident.

Even though the DME engineer applied the emergency brake near the incorrectly lined north yard hand-operated switch, the train continued to move about 240 feet before colliding with the railcars on yard track No. 3. The locomotive’s event recorder showed that the DME engineer had placed the train into emergency braking and had fully applied the locomotive independent brake.

¹² Dakota, Minnesota & Eastern Railroad, *Supplement to Fifth Edition, General Code of Operating Rules*, effective June 13, 2009.

¹³ NTSB investigators performed sight-distance tests and determined that the switch position indicator light for the remote-controlled north siding switch was visible upon exiting the curve for the length of the straight track (2,600 feet). The default switch position indicator light displays solid red. It displays a green aspect when correctly lined for main track movement and a flashing red aspect when correctly lined for the siding. The aspect was displayed on both sides of the switch position indicator light. That is, it could be seen when approaching the switch position indicator light from either direction.

The NTSB further recommends that the FRA require that, until appropriate switch position warning technology is installed on main track switches (in non-signaled territory not equipped with positive train control), when a main track switch has been reported relined for a main track, the next train to pass the location approach the switch location at restricted speed. That train crew should then report to the dispatcher that the switch is correctly lined for the main track before trains are allowed to operate at maximum authorized speed.

Therefore, the National Transportation Safety Board makes the following safety recommendations to the Federal Railroad Administration:

Require railroads to install, along main lines in non-signaled territory not equipped with positive train control, appropriate technology that warns approaching trains of incorrectly lined main track switches sufficiently in advance to permit stopping. (R-12-27)

Revise Title 49 *Code of Federal Regulations* Section 218.105(d)(1) to require that, until the appropriate switch position technology is installed on main track switches in non-signaled territories that are not equipped with positive train control, train crews releasing track authority to the dispatcher must hold job briefings with the dispatcher and clearly convey the position of all main track switches that were used prior to releasing track warrant authority. (R-12-28)

Require that until appropriate switch position warning technology is installed on main track switches (in non-signaled territory not equipped with positive train control), when a main track switch has been reported relined for a main track, the next train to pass the location approach the switch location at restricted speed. That train crew should then report to the dispatcher that the switch is correctly lined for the main track before trains are allowed to operate at maximum authorized speed. (R-12-29)

As discussed in the Bettendorf accident report, the NTSB reclassifies the following previously issued recommendation to the FRA:

Require that, along main lines in non-signaled territory, railroads install an automatically activated device, independent of the switch banner that will, visually or electronically, compellingly capture the attention of employees involved with switch operations and clearly convey the status of the switch both in daylight and in darkness. (R-05-14)

Safety Recommendation R-05-14, previously classified “Open—Acceptable Alternate Response,” is reclassified “Closed—Superseded.” Safety Recommendation R-05-14 is superseded by Safety Recommendation R-12-27.

The NTSB also issued safety recommendations to the Dakota, Minnesota & Eastern Railroad (now a subsidiary of Canadian Pacific Railway).

In response to the recommendations in this letter, please refer to Safety Recommendations R-12-27 through R-12-29. We encourage you to submit updates electronically

at the following e-mail address: correspondence@ntsb.gov. If your response includes attachments that exceed 5 megabytes, please e-mail us at the same address for instructions. To avoid confusion, please do not submit both an electronic copy and a hard copy of the same response.

Chairman HERSMAN, Vice Chairman HART, and Members SUMWALT, ROSEKIND, and WEENER concurred in these recommendations.

[Original Signed]

By: Deborah A.P. Hersman
Chairman