



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: June 1, 2012

In reply refer to: R-12-36

Mr. Michael Melaniphy
President and Chief Executive Officer
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The National Transportation Safety Board (NTSB) is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendation in this letter. The NTSB is vitally interested in this recommendation because it is designed to prevent accidents and save lives.

This recommendation addresses inadequate procedures within the Washington Metropolitan Area Transit Authority (WMATA) Operations Control Center (OCC)¹ for protecting roadway workers; inadequate procedures within the OCC to coordinate work between two separate roadway worker work groups; inadequate communication between roadway worker work groups; and inadequate Federal agency oversight of roadway worker policies and procedures. The recommendation is derived from the NTSB's investigation of the January 26, 2010, accident when a WMATA hi-rail maintenance vehicle struck two wayside workers near the Rockville Metro Station in Rockville, Maryland, and is consistent with the evidence we found and the analysis we performed. As a result of this investigation, the NTSB has issued five safety recommendations, one of which is addressed to the American Public Transportation Association (APTA). Information supporting this recommendation is discussed below. The NTSB would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendation.

On January 26, 2010, about 1:40 a.m., a hi-rail vehicle—a truck or automobile that can be operated on either highways or rails—operating southbound about 0.9 miles north of WMATA's Rockville Metro Station struck and fatally injured two automatic train control (ATC) technicians²

¹ The *Operations Control Center* communicates and controls the movement of trains and other track equipment over the entire WMATA Metrorail system.

² Throughout the rest of this report, the fatally injured technicians will be referred to as ATC No. 1 technician and ATC No. 2 technician.

who were working on the right-of-way (ROW) replacing an impedance bond between the tracks. The hi-rail vehicle was traveling down the track in the reverse gear at about 13 mph.³

The NTSB determined that the probable cause of the accident was inadequate safeguards by WMATA to protect roadway workers from approaching hi-rail vehicles, and to ensure hi-rail operators were aware of any wayside work being performed. Contributing to the accident was the inadequate communication of vital information concerning ongoing work by the OCC; the lack of an appropriate and effective lookout by the hi-rail vehicle operator and crew to carefully observe the track on approach; and the ineffective lookout for trains and/or hi-rail vehicles on the part of the ATC technicians.

Preaccident Events

Normal Red Line train movements are controlled by an ATC system. Typically, WMATA's hi-rail maintenance vehicles and other on-track maintenance equipment are not equipped to operate with an ATC system. Instead, the authority to move the self-propelled vehicles is directed by the OCC, which issues absolute block⁴ movement authorities.

Prior to the accident, WMATA operations were transitioning from revenue train operations to nightly maintenance activities. Most maintenance work is prescheduled on a general order form that outlines what equipment and crews will be needed at which locations. The first two on-rail maintenance vehicles were dispatched out of the Shady Grove Metro Station while operating under absolute blocks on the A-1 track. WMATA rules require the OCC to establish absolute blocks to move on-rail work equipment to or from work areas.

On the night of the accident, the ATC No. 1 technician and the ATC No. 2 technician were troubleshooting ATC system problems on the A-2 track between the Shady Grove and Rockville stations that were reported earlier in the day. The ATC No. 1 technician had made temporary modifications to the equipment in the train control room to establish train speed restrictions through the area where they were working. The technicians were performing their troubleshooting under traffic, clearing the tracks when trains approached. The normal shift change time for ATC employees is 10:30 p.m. However, on that day, the ATC supervisors at the Shady Grove station conferred and determined that it would be best if the ATC No. 1 technician and the ATC No. 2 technician continued to work on the problem at Chain Marker (CM) 852.

On the night of January 25, 2010, several on-rail maintenance vehicle movements were scheduled to depart the Shady Grove station. At 11:42:08 p.m., the ATC No. 1 technician on the ROW called the OCC on the telephone and told the operator that there was a bad impedance bond⁵ on track A-2, CM 852+00, and that track circuits A-2, CM 852 and

³ *Washington Metropolitan Area Transit Authority Hi-Rail Maintenance Vehicle Strikes Two Wayside Workers Near the Rockville Station, Rockville, Maryland, January 26, 2010*, Railroad Accident Report NTSB/RAR 12/04 (Washington, D.C.: National Transportation Safety Board, 2012). <<http://www.nts.gov>>

⁴ *Absolute block* is a section of track between two specific locations onto which no train, hi-rail vehicle, or track equipment is permitted to enter while it is occupied by another train.

⁵ An *impedance bond*, (also known as a "Wee-Z bond") is a device used to transmit frequency signals into the rails. These bonds are split between blocks. Each one acts as a transmitter for one block and a receiver for an adjacent block.

A-2, CM 846 would not be operating while the bond was being changed. The OCC operator offered to notify other work groups in the area of the work being done at CM 852 and asked the ATC No. 1 technician to provide a cell phone number. The ATC No. 1 technician asked, "They know the chain marker we're at, right? Can you relay that to them?" Operator No. 1 agreed to arrange for the additional workers to contact the ATC No. 1 technician on the cell phone. The ATC No. 1 technician stated that he and the ATC No. 2 technician would watch for any equipment entering the work area.

The third maintenance vehicle to depart the Shady Grove station was the striking hi-rail vehicle (15802). The four track workers⁶ on board had been assigned to inspect and replace third-rail cover boards⁷ on the A-2 track between the Shady Grove and Rockville stations.

Operator No. 2 was handling the communication with the leadman on hi-rail vehicle 15802 and indicated in interviews a belief that Operator No. 1 had communicated to the leadman on the hi-rail vehicle a contact cell phone number for the two ATC technicians. However, recorded audio tapes of the conversation between the first OCC operator and the hi-rail vehicle showed that the operator did not give the contact cell phone number to the hi-rail crew.

At 11:55:27 p.m., the hi-rail operator contacted the OCC operator by telephone and was told to move down to CM 787+00 on the A-2 track, located south of where the ATC No. 1 technician and the ATC No. 2 technician were working. Operator No. 2 stated, "...would take them down track A-2 at Twinbrook⁸ and bring them back to keep traffic because they have a loss of shunt down there between Rockville and Shady Grove and ATC is still working on it wayside."

In a subsequent conversation with the leadman for the hi-rail crew, the OCC operator said that ATC personnel were working between the Rockville and Shady Grove stations. However, the OCC operator did not give the leadman a CM location, or the ATC No. 1 technician's cell phone number. The NTSB concludes that had the OCC operators provided the crew of striking hi-rail vehicle 15802 with the cell phone number of the ATC No. 1 technician and instructions to coordinate their work, the accident could have been prevented.

The next and final radio communication between the OCC operator and the ATC No. 1 technician occurred at 12:05:13 a.m., when the OCC operator notified the ATC No. 1 technician that an engine was being moved on the A-1 track and that the hi-rail vehicle was clear of the A15-08 signal (which is located north of the where the ATC technicians were working) on the A-2 track. The ATC No. 1 technician stated that he was "momentarily" clear of the track and that the ATC No. 2 technician would monitor the radio and "stand clear if he sees a train." No further radio communication between the OCC and the ATC No. 1 technician was recorded.

The last absolute block movement authority transmitted to hi-rail vehicle 15802 was to move from interlocking signal A15-06 to clear signal A15-08 and to then stand by for further

⁶ The four workers consisted of the leadman, the hi-rail operator, and the two track laborers.

⁷ *Third-rail cover boards* are fiberglass covers designed to protect the electrified third rail, which provides power to trains.

⁸ Twinbrook is the next station stop, located south of the Rockville Metro Station.

instructions. After making a series of movements at the Shady Grove interlocking,⁹ hi-rail vehicle 15802 reported being clear of signal A15-08 on the A-2 track. The interlocking signals are located just south of the Shady Grove station.

Prior to receiving permission from the OCC to move, the hi-rail vehicle began traveling in the reverse direction on track A-2 from the Shady Grove station, toward a point just north of the Rockville station. Before reaching its destination, the hi-rail vehicle struck and fatally injured the ATC No. 1 and No. 2 technicians.

Interviews conducted by the NTSB revealed that prior to the accident, several maintenance employees understood that the OCC operator's permission to establish a work area conveyed authority to move to the far end of that work area, slightly north of the Rockville station. Both OCC operators indicated to investigators that hi-rail vehicle 15802 was not authorized to leave the Shady Grove station and that when the hi-rail operator notified them of the accident, they were surprised to learn that the unit had moved. The NTSB concludes that, without clear written procedures, there was confusion among operating personnel at the OCC and vehicle operators regarding when field crews were authorized to move on-rail equipment within red tag work areas.

Postaccident Testing

At the time of the accident, the hi-rail vehicle operator was in the driver's seat, the leadman was in the passenger seat, and two laborers were in the rear seats. According to the hi-rail vehicle operator, he was moving the vehicle in reverse at an engine speed of about 1,500 rpm at the time of the accident.¹⁰ NTSB investigators determined during the sight distance and vehicle performance testing on April 23, 2010, that the calculated reverse vehicle speed at 1,500 rpm was about 13 mph.

The hi-rail vehicle was operated in reverse, going south on the A-2 track, approaching the accident location. The light switches were set for the positions they were found in after the accident, with the roof-mounted strobe light bar and the rear-mounted rail lights (one on each side, similar to headlights) on.

The hi-rail vehicle was equipped with an audible-tone backup alarm; however, that alarm did not sound when the vehicle was operated in reverse at the scene of the accident. Investigators discovered that this was because the switch to the rail lights was found to be in the on position at the time of the accident. This switch is typically turned on whenever a hi-rail vehicle is operated in reverse on a track because it applies the rail lighting system and reverses the white and red lighting that define the front and rear of the vehicle. WMATA's policy was that when operating in reverse, the rear of the vehicle, in effect, becomes the front. Therefore, the backup alarm is deactivated. WMATA representatives informed investigators that all of their hi-rail vehicles are set up in that manner. For the test, the rail lights' switch was toggled off, activating the auditory backup alarm on the hi-rail vehicle. As with the sight distance testing, observers were positioned

⁹ *Interlocking* is defined as an arrangement of signals and signal appliances so interconnected that their movements must succeed each other in correct sequence.

¹⁰ The operator could not reference the speedometer since it does not register speed when operated in reverse.

at the accident location. This time, they were instructed to note when they heard the backup alarm of the approaching vehicle. Observers reported hearing the backup alarm when the vehicle was about 2,270 feet from the accident location. When moving at a speed of 13 mph, the hi-rail vehicle could be heard for about 2 minutes on approach to the accident location.

Audible Backup Alarms

Between 2002 and 2010 there were 20 roadway worker fatalities on transit properties. There are no Federal Transit Administration (FTA) regulations regarding backup alarms on hi-rail vehicles used by rail transit agencies. The Federal Railroad Administration (FRA) has a regulation requiring all new hi-rail vehicles to be equipped with an automatic change-of-direction alarm or backup alarm that provides an audible signal at least 3 seconds long and distinguishable from the surrounding noise.¹¹ However, transit agencies, such as WMATA, are not subject to compliance with FRA regulations.

APTA has voluntary standards on roadway worker protection, but does not address hi-rail vehicle backup alarms. There is also a Federal Occupational Safety and Health Administration (OSHA) requirement that no employer shall use any motor vehicle equipment having an obstructed view to the rear unless the vehicle has a reverse signal alarm audible above the surrounding noise level or is backed up only when an observer signals that it is safe to do so.¹² Public entities like WMATA are exempt from Federal OSHA regulations unless those Federal requirements are adopted by the state. The state of Maryland has adopted and enforces the Federal OSHA standards. Maryland Occupational Safety and Health issued a “Citation and Notification of Penalty” to WMATA under Labor and Employment Article, Section 5-104(a) that the vehicle had an obstructed view to the rear and was not equipped with a backup alarm.

The FRA has already recognized that backup alarms are needed to ensure worker safety. The NTSB concludes that an audible backup alarm might have helped to prevent this accident.

Therefore, the National Transportation Safety Board makes the following safety recommendation to the American Public Transportation Association:

Establish guidelines and standards to require that all existing and new hi-rail vehicles be equipped with an automatic change-of-direction or backup alarm that provides an audible signal that is at least 3 seconds long and is distinguishable from the surrounding noise. (R-12-36)

The NTSB also issued safety recommendations to the FTA.

In response to the recommendation in this letter, please refer to Safety Recommendation R-12-36. 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.

¹¹ Title 49 CFR Section 214.523(c).

¹² Title 29 CFR Section 1926.601(b)(4).

Chairman HERSMAN, Vice Chairman HART, and Members SUMWALT, ROSEKIND, and WEENER concurred in this recommendation.

[Original Signed]

By: Deborah A.P. Hersman
Chairman