



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Issued: February 24, 2022

Railroad Investigation Report: RIR-22/04

Union Pacific Railroad Employee Fatality

Vail, Arizona

January 31, 2021

1. Factual Information

1.1 The Accident

On January 31, 2021, about 12:40 p.m. local time, a Union Pacific Railroad (UP) employee was struck by a railbound track maintenance tamper (TMT) on a main track near Vail, Arizona.¹ The employee was airlifted to a hospital, where he later died from his injuries. The employee was part of a tie gang comprising about 50 people and 23 pieces of equipment, performing crosstie renewal and track surfacing.² Figure 1 shows the track where the fatality occurred and the final resting position of the TMT.

¹ (a) Visit [ntsb.gov](https://www.nts.gov) to find additional information in the [public docket](#) for this NTSB investigation (case number RRD21LR007). Use the [CAROL Query](#) to search safety recommendations and investigations. (b) All times in this report are local time unless otherwise noted. (c) A *track maintenance tamper (TMT)* is a machine equipped with hydraulic tools designed to lift individual crossties into proper vertical and horizontal position while vibrating tools (workheads) pack ballast under the crosstie to ensure it remains in position.

² *Track surfacing* raises the track structure to obtain the desired track geometry. This work is primarily accomplished using specialized railroad work equipment.



Figure 1. Aerial photograph of TMT in postaccident location. (Photo provided by Pima County Sheriff's Department.)

The tie gang went on duty about 8:00 a.m. and traveled by bus to the Marsh Setout Track to retrieve equipment before moving to the main track where the work was to be done that day. The roadway worker-in-charge conducted an on-track safety briefing and established working limits through a track authority with the train dispatcher. According to the safety captain, worker safety and proper equipment spacing in accordance with UP rules were also discussed. According to the manager of track programs at UP, the standard distance between the workers on the ground and the machines was 25 feet, but when using the TMT, the operator would maintain about 70 feet between the TMT and the ground worker ahead because of visibility limitations for the TMT operator.

About 9:28 a.m., the tie gang had completed road maintenance machine inspections (including a Nordco, Inc. TMT) and began to move from the siding to the main track. (Figure 2 shows the TMT.) The TMT operator said that when work on the track began, he was tamping new crossties, and the ground worker was marking ties ahead of him by "spray(ing) the down ties" with paint to indicate that those crossties needed to be tamped.³ The operator of the machine ahead of the TMT reported that the ground worker was the appropriate distance from the machines ahead of and behind him. The TMT operator stated that as he was working, he would look down then forward to

³ *Tamping* a crosstie is a mechanical process in which ballast rock is forced under the crosstie to restore uniformity to the track structure.

maintain distance between his equipment and the ground worker, who was in his normal position between the rails.



Figure 2. Photo of TMT at the accident scene. (Photo provided by UP.)

The TMT operator estimated that on that day, he had tamped between 100 and 150 crossties. He stated that just before the accident, he had tamped a crosstie and was going to skip five crossties to get to the next crosstie that required tamping. To operate the Nordco TMT, the operator pushes the joystick forward to move forward; when the joystick is released, propulsion stops, and the friction brakes are applied. The operator stated that, on the day of the accident, he "...indexed the machine forward and ... let go of the joystick in going forward position and it seemed like it didn't stop to me. That's when I started panicking." The operator recounted that he tried to activate the horn to alert the ground worker ahead of him. However, in his panic, he was not successful in pulling on the horn cable above his head. He also did not push the emergency stop button that was "right there" (on the left console), and he could not explain why he did not. The operator said that the last time he saw the ground worker, the worker was about 10 feet ahead of the TMT. The operator then pulled the joystick back into the work cycle and dropped the tamper workheads into the ballast, effectively stopping the forward motion of the TMT. On the sudden stop, the operator fell forward, hit his head and knee

on the front windshield of the equipment, and sustained minor injuries.⁴ Subsequently, the ground worker was found underneath the tamper.

1.2 Site Observations

Postaccident observations revealed that the TMT had continued past about 15 crossties that would have required tamping, which was about 70 feet beyond where the TMT should have stopped.⁵

1.3 Track Maintenance Tamper Testing

On February 1-2, 2021, UP investigators conducted inspections and tests of the accident TMT with the assistance of Nordco, Inc. on the Lordsburg Subdivision at a location where the rail profile and grade were similar to the accident location. Damage from the accident was repaired, and the machine was functionally tested; no defects that could have contributed to the accident were found.

The TMT was subjected to brake testing and a simulation of the accident sequence. Testing was conducted in environmental conditions like those at the time of the accident. The TMT traveled from tie 1 to 5 in 3.53 seconds; when the emergency stop button was pushed as the machine reached the 5th tie, the TMT stopped in 11 feet. When the emergency stop button was not pushed, it took 9.33 seconds for the TMT to travel from tie 5 to where the ground worker was impacted. In all cases, the TMT operated normally, as designed.

On March 24-25, 2021, the TMT was further examined and tested at UP's maintenance facility.⁶ When a test operator used the joystick to move the TMT forward to skip five ties (as the accident operator was attempting to do), he released the joystick and the TMT stopped within about 5 feet. The TMT stopped in the same distance when the service brake or parking brake was applied. Again, the TMT behaved as expected and came to a stop as designed.

1.4 Tamper Operator

⁴ He was not wearing a seatbelt, and UP rules did not require that he wear one while tamping.

⁵ The tamper stopped about 17 feet behind the next piece of equipment.

⁶ (a) The National Transportation Safety Board, Federal Railroad Administration, Union Pacific Railroad, Nordco Incorporated, and Brotherhood of Maintenance of Way Employees participated in the examination and testing. (b) The Brotherhood of Maintenance-of-Way Employees Division spells the word "Employees" in its name with one e. Therefore, we are using that spelling in this report.

According to UP documentation, the TMT operator was qualified to operate the TMT on November 20, 2002. He was also qualified to operate other railroad maintenance machines.

In the days leading up to the accident, the TMT operator said that he had had sufficient, good-quality sleep at a hotel located about 15 miles from the work site. He indicated that he was “energized” and “ready to go” by the time work started at 8:00 a.m. He did not have his cell phone with him in the TMT when the accident occurred. Postaccident toxicology testing revealed negative results for all tested-for substances.⁷

1.5 Postaccident Actions

In response to the accident, UP initiated an operational testing plan focused on additional stop-distance testing of equipment operators. This increased testing occurred in March through May 2021, each month emphasizing a different aspect of equipment operational safety. On February 8, 2022, UP representatives informed the National Transportation Safety Board (NTSB) that they had found the increased testing beneficial and that they plan to continue testing activities in 2022.

2. Analysis

On the day of the accident, the tie gang was conducting crosstie renewal operations including tamping. The TMT operator was about 70 feet behind the ground worker, who was marking ties for the TMT operator to tamp. The TMT operator reported that when he released the joystick after advancing the TMT to the next tamping location, he believed the TMT would stop, but it continued to move forward. He attempted to blow the horn to alert the ground worker but did not; he did not attempt to use the emergency stop button. He then put the TMT into the work cycle, which eventually stopped its motion but not before it struck the ground worker. Based on the postaccident inspections and testing, the NTSB determined that the TMT was free of any condition that could result in unintended movement or failure to stop and likely was operating normally on the day of the accident.

The NTSB did not identify any factors that would have affected the TMT operator’s handling of the TMT. He was qualified on the TMT and had almost 19 years’ experience operating TMTs and other roadway maintenance machines. He believed that he was well rested on the day of the accident, and toxicology testing was negative. The operator had sufficient time (about 9 seconds) and distance (over 70 feet) in which to recognize the situation and press the emergency stop button to stop the TMT. However, it could not be

⁷ FRA post-accident toxicology testing includes a drug screen of urine. If there are positive findings, confirmation testing is performed on blood. Testing includes drugs in the following categories: amphetamines, barbiturates, benzodiazepines, cannabinoids, cocaine, opioids, phencyclidine, and sedating antihistamines.

determined why the TMT operator was unable to stop the TMT, other than his panicked state, before the machine impacted the ground worker.

3. Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the operator's failure to stop the track maintenance tamper's forward movement due to his panicked state before striking the ground worker.

The National Transportation Safety Board (NTSB) is an independent federal agency dedicated to promoting aviation, railroad, highway, marine, and pipeline safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974, to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)).

For more detailed background information on this report, visit the NTSB investigations website and search for NTSB accident ID RRD21LR007. Recent publications are available in their entirety on the NTSB website. Other information about available publications also may be obtained from the website or by contacting—

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