



National Transportation Safety Board

Washington, D.C. 20594

Railroad Accident Brief

Accident No.: DCA-12-FR-003
Location: Amarillo, Texas
Date: January 9, 2012
Time: 11:09 a.m. central standard time
Railroad: BNSF Railway
Property Damage: \$150
Injuries: 0
Fatalities: 1
Type of Accident: Employee struck by moving equipment

The Accident

On Monday, January 9, 2012, at 11:09 a.m. central standard time,¹ a BNSF Railway (BNSF) welding foreman on yard track No. 1805 near Amarillo, Texas, was struck and killed by a J6 rail grinding machine.

The grinding machine was operated by a Loram² crew consisting of a superintendent field operations/equipment operator, a general laborer (Loram laborer), a crew chief, and a safety coordinator.³ At the time of the accident, the crew chief was getting parts for the equipment and was not at the accident location.

A Loram general laborer said that the welding foreman had given a hand signal for a reverse-movement to the machine operator, and then the foreman walked across the north rail into the center of the track to the derail⁴ on the south rail. The foreman crouched down with his back to the grinding machine to unlock the derail and remove it from the south rail to allow the reverse movement. When the operator realized that the welding foreman was in the gage of the track, he could not stop the equipment before it struck the welding foreman. (See figure 1 for a side view of the grinding machine in relation to the derail location and distance traveled after the accident.)

¹ All times in this brief are central standard time.

² Loram Maintenance of Way was contracted by BNSF

³ The safety coordinator was not a routine crewmember; this was the first day of a 2-day safety audit.

⁴ A *derail* is a device designed to limit the movement of railroad rolling stock into areas where they could cause personal injury or damage to other equipment and structures.

The welding foreman was part of a two-member BNSF track maintenance crew consisting of himself, who was the roadway worker in charge⁵ of the rail grinding operation at the time of the accident, and a laborer (BNSF laborer).⁶ However, the BNSF laborer had called the welding foreman earlier that day to say that he was going to arrive at the worksite late, and he was not on site at the time of the accident.

The weather at the time of the accident was about 37°F and clear. The wind direction was to the northeast and about 5 mph.



Figure 1. Side view of the Loram J6 rail grinding machine.

Accident Sequence

On the morning of the accident, the Loram crew arrived at the J6 rail grinding machine about 6:30 a.m. After an initial job briefing, the operator started the grinding machine. The crew then had a more thorough job briefing next to the grinding machine. They also conducted a walk-around inspection of the equipment.

⁵ *Roadway worker in charge* means a roadway worker who is qualified in accordance with Title 49 *Code of Federal Regulations* (CFR) 214.353 to establish on-track safety for roadway work groups.

⁶ The BNSF laborer's duties were to perform work tasks as directed by the welding foreman.

The BNSF crew arrived at the grinding machine⁷ about 7:30 a.m., and the BNSF welding foreman led a joint job briefing with the Loram crew. The briefing lasted about 1 1/2 hours; topics covered during the briefing included safety expectations; rules compliance; understanding track charts, timetables, and authorities; the work plan for the day; fire safety; and lockout/tagout procedures.

The work planned for that day included grinding rail in a series of switches between mileposts 334 and 308 on the BNSF Red River Valley Subdivision. The first switch was at milepost 334, within 1 mile of the accident location. To get to the first switch, the grinding machine moved out of the yard tracks and onto the lead track that went east. As the grinding machine left the yard tracks the welding foreman had to open and close several derails and switches before the machine could enter track No. 1805. (See figure 2.) The foreman had given hand signals to the operator to move and stop the machine as needed. After traveling for a while on track No.1805, the grinding machine arrived near the accident location.

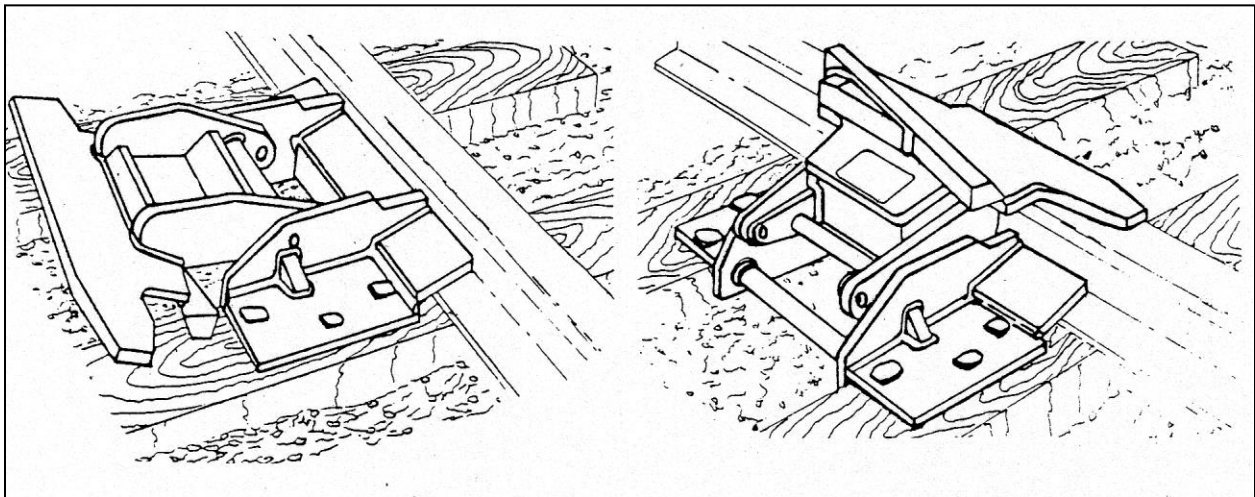


Figure 2. Hinged derail: Left: Off the rail, Right: On the rail.

BNSF radio recordings indicated that the welding foreman had spoken with the yardmaster before leaving his yard location and moving the equipment eastward on track No. 1805 toward main track No. 2 of the Red River Valley Subdivision. (See figure 3 for an overhead view of the accident area at the derail.)

⁷ The grinding machine was located on yard track No. 0604 in the Amarillo south yard, about 1 1/2 miles from the accident site.



Figure 3. Overhead view facing west of track No. 1805 with derail opposite signpost D.

After the equipment stopped,⁸ the welding foreman restored the derail to the derailing “on” position and secured the derail with its lock. He then walked to the control cab to tell the machine operator he had noticed a hydraulic leak as the grinding machine passed him. The welding foreman, the machine operator, and the Loram laborer evaluated the leak and determined they needed to move the equipment back into the yard to make the necessary repairs, because the leak was too severe to continue to the work location. The operator told investigators that he and the welding foreman decided that the derail would have to be removed to allow for the reverse movement. The operator also said that he and the welding foreman had walked together to the cab of the grinding machine, and then he had climbed into the cab. The operator said that shortly after he entered the cab, the welding foreman gave him a hand signal to make a westbound (that is, a reverse) movement.

The Loram laborer stated that he was on the west end of the grinding machine, he could see the operator, and he was observing the grinding machine movement. He said that he could see the welding foreman from the time he gave the signal until the grinding machine struck him. The Loram laborer said that after the welding foreman gave the hand signal he walked to the

⁸ The trailing end of the grinding machine stopped about 32.5 feet past the derail.

derail, crouched down with his back to the grinding machine, unlocked the derail, and began to remove it from the south rail.

The Loram laborer stated that he was aware the grinding machine was moving west and that the welding foreman was “foul” of the movement, but he believed that the operator would stop short of the derail. The operator stated that he took action to stop the grinding machine immediately when he saw the welding foreman in his camera.⁹ It is not known at what point the operator saw the welding foreman in his camera. However, in postaccident sight-distance tests, the main camera, pointing in the direction of the westbound movement, showed an image of a person’s work boots about 18 feet from the grinding machine.

When the Loram laborer realized that the grinding machine might not be able to be stopped short of the welding foreman, he yelled for the welding foreman to get out of the way. However, the Loram laborer assumed that the welding foreman did not hear him because of the noise of the grinding machine engine and the hearing protection that the welding foreman was wearing. Also, the welding foreman had his back to the grinding machine as it was approaching. The Loram laborer said he saw no body movement to indicate that the foreman had heard his attempt to alert the foreman to the danger.

Operating and Safety Rules

Loram operating rules state that only a Loram employee may signal a movement to the Loram operator unless the operator has clear line of sight for the movement. A point person—person positioned at the front of the grinding machine—must signal every movement with a positive confirmation that the path is clear. When movements are signaled to the operator, they must be made in accordance with Loram Operating Rules. Loram operating rules also state that employees must ensure that switches and derails near the equipment have been properly lined for movement.

Both BNSF maintenance-of-way rules and Loram rules require that if a person who gave a signal to back or shove disappears, or the light that person is using disappears, the backing or shoving movement must stop.

Job Responsibilities and Training

The BNSF welding foreman—the BNSF roadway worker in charge—was assigned, to escort the Loram grinding machine while it traveled and worked on BNSF property. His training for this position included BNSF Employee Safety Rules and Maintenance-of-Way Operating Rules courses. He had passed both training courses and was qualified as a roadway worker in accordance with the Federal Railroad Administration (FRA) roadway worker protection regulations in 49 CFR 214.343 (Training and qualification, general) and 214.353 (Training and qualification of roadway workers who provide on-track safety for roadway work groups). One of the welding foreman’s duties was to move derails to the “off” and “on” positions as needed for grinding machine movements.

⁹ The grinding machine had several cameras that viewed the rail and that were used in the grinding (or work) mode so the operator knew when to sequence the grinding operations.

The Loram grinding machine operator, the laborer, and the crew chief attended training conducted by Loram¹⁰ on January 5 and 6, 2012, just a few days before the January 9 accident. They were tested on the BNSF safety and operating rules to ensure compliance with the FRA roadway worker protection regulations. Also on January 6, 2012, the Loram safety coordinator took the online BNSF safety and operating rules course. The safety coordinator had previously taken roadway worker training in January 2011, which qualified him through December 31, 2012. All four Loram employees successfully completed their training with scores of 100 percent on their tests. However, the crew did not comply with Loram's point protection and signaling movement rules on the day of the accident. Additionally, the Loram safety coordinator on board the grinding machine at the time of the accident did not correct the crew's noncompliance with Loram safety rules.

A review of the Loram training syllabus and test questions indicated that neither the syllabus nor the test questions included critical point protection and signaling movement operating rules that governed the J Series grinding machine movements.

Toxicological Tests

After the accident, toxicological tests were performed on the four Loram employees, and a medical examiner conducted postmortem toxicological tests on the welding foreman. The tests for alcohol and illegal drugs were conducted in accordance with 49 CFR Part 219, Subpart C, *Post-Accident Toxicological Testing*. All test results were negative.

Loram Postaccident Actions

After the accident, Loram upgraded¹¹ all its grinding machines that have center cabs with the following additional safety features for the point person and the machine operator:

- Fixed position color travel cameras at either end of the machine. The travel camera field of view (FOV) will overlap the sequence camera FOV. An additional monitor was installed at the operator console dedicated to the travel cameras.
- An "Alert" horn button tied into the machine travel horn circuit in series with the units mounted at the four-corner ladders.
- A "Machine Stop" button for use by the point person. (Tests have shown 100-foot stopping distance at 10 mph and 12 feet at 3 mph.)

¹⁰ The BNSF and Loram training/testing were not joint exercises.

¹¹ The J6 upgrades were completed about 2 weeks after the accident, and all Loram's other grinding machines were upgraded within 2 months.

On November 2, 2012, Loram also issued a safety advisory to 11 contractor/equipment/service providers that provide similar services and operate equipment similar to Loram's for railroad track maintenance operations. The safety advisory included the following:

- an explanation of the circumstances of the accident
- a discussion of critical operating rule testing for center cab equipment
- a discussion of the upgrades that were made to the J6 rail grinding machine

In addition, Loram added a Specialty Grinder section to its operating rule book and training syllabus, which requires all employees to follow the point protection and signaling movement rules:

Point Protection

Only Loram employees may operate Loram equipment. Likewise, only a Loram employee may provide point protection for a Loram operator. Point protection is required whenever the operator has obstructed vision and as provided by the following Loram Operating Rule:

11.22 – For all non-front cab controlled machines, a Loram employee must be positioned on the leading end of the equipment when:

- (a) Traveling through yards, sidings, or into back tracks, to confirm that switches, derails, interlocks and frogs are properly lined for the movement; or
- (b) Grinding, digging or ditching over or by a track side warning detector or other related equipment to confirm the location of the railroad equipment to the operator.
- (c) It is the operator's responsibility to notify a Loram employee to provide point protection. If a Loram employee is not in proper position, the machine must be stopped. On ballast and grade equipment, the employee may be on the ground.

A point person is responsible for maintaining constant communication with the operator to warn of obstructions and direct movements. For example, a Loram point person is responsible for ensuring compliance with the following Loram Operating Rule when a Loram operator is unable to personally ensure compliance.

11.18 – Employees must ensure that switches and derails near the equipment have been properly lined by railroad personnel for movement.

The Loram operator, point person and every other affected person must have mutual understanding of planned moves:

6.1(b) – Teamwork is essential to safety. Everyone involved in a particular project must know what moves are going to be made when working as a group.

Signaling Movement

Unless the Loram operator has clear line of sight for the movement, only a Loram employee may signal a movement to the Loram operator. A point person must signal every movement with a positive confirmation that the path is clear. When movements are signaled to the operator, they must be made in accordance with the following Loram Operating Rule:

11.33 – When moving equipment in response to hand signals, if the employee or light giving signals disappears from view, it must be regarded as a stop signal.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the BNSF welding foreman's entering the gage of the track in front of the moving Loram grinding machine. Contributing to the accident was Loram's ineffective training on the operating rules governing point protection and signaling of equipment movement.

Adopted: August 30, 2013