



AVIATION



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PIPELINE

Issued: July 22, 2024

Railroad Investigation Report RIR-24-06

Norfolk Southern Railway Employee Fatality

Cleveland, Ohio

March 7, 2023

1 Factual Information

1.1 Accident Description

On March 7, 2023, about 1:08 a.m. local time, a Norfolk Southern Railway (NS) conductor on NS train C75B106 was killed when the train collided with a dump truck as it entered a private highway-railroad grade crossing (private grade crossing) in the Cleveland-Cliffs Incorporated (Cleveland-Cliffs) steel plant in Cleveland, Ohio.¹ (See figure 1.) The conductor was riding the lead railcar during a shoving movement when he was pinned between the railcar and the dump truck during the collision.² NS and Stein LLC (the dump truck owner) estimated total damages to equipment to be about \$42,000.³ Visibility conditions at the time of the accident were dark and clear; the weather was 34°F with no precipitation.

¹ (a) All times in this report are in local time unless otherwise noted. (b) Visit [ntsb.gov](https://www.ntsb.gov) to find additional information in the [public docket](#) for this NTSB investigation (case number RRD23LR007). Use the [CAROL Query](#) to search safety recommendations and investigations. (b) *Private highway-railroad grade crossings* are intersections of highways and railroads on roadways either not open to public travel or not maintained by a public authority. They are on privately owned roadways and are intended for use by the owner or by the owner's licensees and invitees. They are not intended for public use and are not maintained by a public highway authority. Private grade crossings may be governed by legal agreements between private property owners and private railroad companies. (c) Cleveland-Cliffs Incorporated is the largest flat-rolled steel company in North America and a leading supplier of automotive-grade steel.

² A *shoving movement* is the process of pushing tank cars or pushing a train from the rear with a locomotive.

³ Stein LLC is a subsidiary of TMS International, the largest provider of industrial services to steel mills in North America.

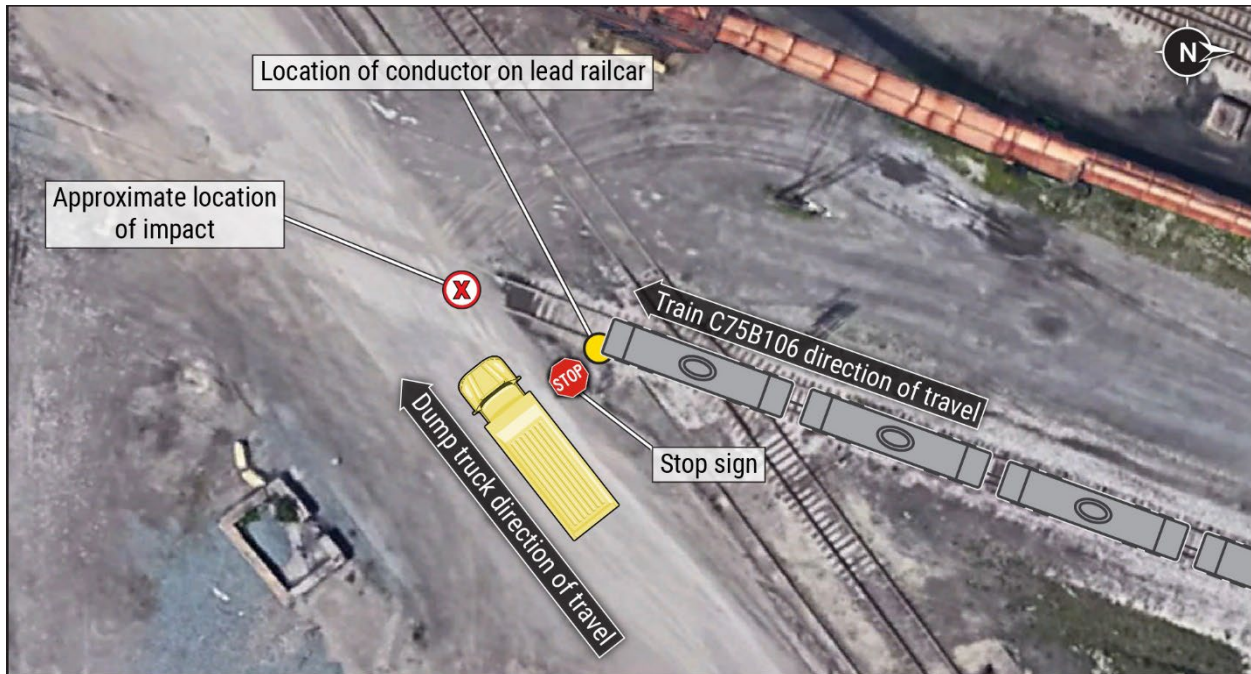


Figure 1. A satellite view of the accident scene. (Source: Google Earth.)

The crew of train C75B106 consisted of an engineer and the conductor. The train was composed of 1 locomotive and 12 mixed railcars: 4 residue tank cars and 8 empty covered hopper cars.

The National Transportation Safety Board’s (NTSB) review of event recorder data showed that at 1:08 a.m. train C75B106 was traveling about 9 mph as it approached the private grade crossing. The maximum authorized speed within Cleveland Cliffs was 10 mph.⁴ The engineer, while operating the locomotive during the shoving movement, relied on the conductor who was riding the front of the leading railcar to protect train movement. The conductor was communicating railcar counts over the radio as the train approached the crossing.⁵ The engineer told NTSB investigators that, shortly after saying the crossing was clear, the conductor announced stop over the radio to the engineer during the railcar count. The engineer immediately applied the train’s full-service brakes and the locomotive’s independent brakes; the train’s forward momentum carried it into the crossing.⁶

⁴ NS Pittsburgh Division. Northern Region Timetable No. 1. Cleveland Line.

⁵ Railroad personnel commonly use *railcar counts* to communicate distances during shoving operations. One railcar length is about 60 feet.

⁶ *Full-service braking* initiates maximum braking for the train while in service. *Independent brakes* apply air brakes to the locomotive (or multiple units) independently from the train’s brakes.

The dump truck was driven by a Stein LLC employee and was hauling limestone at the time of the collision. Cleveland-Cliffs surveillance camera data reviewed by NTSB investigators showed the dump truck traveling south through the steel plant, approaching the private grade crossing. The dump truck stopped at the stop sign at 1:08:29 a.m. Then, at 1:08:32 a.m., the dump truck began moving toward the crossing. The driver applied the brakes upon seeing the approaching train, but the dump truck was already in the crossing. At 1:08:35 a.m., the train and dump truck collided within the crossing. (See figure 2.) During interviews with NTSB investigators, the driver stated that he did not see the train while stopped at the stop sign because of the angle of the crossing and the lack of lighting.



Figure 2. The final resting place of the dump truck and train. (Source: Federal Railroad Administration [FRA].)

1.2 Work History

1.2.1 Norfolk Southern Engineer

The engineer was hired on April 15, 1999. His most recent performance evaluation and knowledge assessment occurred on September 9, 2021, which he

passed.⁷ The engineer was found to be compliant with all efficiency test records that were reviewed by NTSB investigators, which showed an assortment of tests between September 13, 2022, and February 1, 2023.⁸ Of these assorted tests, eight were train movement, stop signals, shove moves, restricted speed, alcohol and drugs, communications, blue signals, and authorized speed.

1.2.2 Norfolk Southern Conductor

The conductor was hired on October 21, 2004. His most recent performance evaluation and knowledge assessment occurred on March 29, 2022, which he passed.⁹ The conductor's recent efficiency test records were reviewed and showed an assortment of testing between September 13, 2022, and January 18, 2023. Of these assorted tests, eight were authorized speed, communications, safety critical rules, personal safety, restricted speed, shove moves, handling switches and derails, and train movement.

1.2.3 Stein LLC Dump Truck Driver

The dump truck driver was hired on January 10, 2022. He had a valid commercial driver's license, was up-to-date on all training and certifications, and was familiar with the property.¹⁰ Stein LLC records showed that the dump truck driver regularly participated in "toolbox meetings" before the accident. Safety topics covered in these meetings included stop signs.¹¹

⁷ Title 49 *Code of Federal Regulations (CFR)* Part 240.

⁸ Efficiency testing in accordance with 49 *CFR* Part 217.

⁹ Title 49 *CFR* Part 242.

¹⁰ Title 49 *CFR* Parts 383 and 384.

¹¹ A *toolbox meeting* is used to make employees aware of the different safety aspects and dangers at the work site.

1.3 Postaccident Toxicology Testing

In accordance with Title 49 *Code of Federal Regulations (CFR)* 219.201, the train conductor underwent postmortem toxicology tests for alcohol and other drugs. No tested-for substances were identified.¹²

At the request of the NTSB, the conductor also underwent postaccident toxicology testing by the Federal Aviation Administration Forensic Sciences Laboratory.¹³ No tested-for substances causal to the accident were identified.

The train engineer did not undergo FRA postaccident toxicological testing.

The postaccident toxicology testing of the dump truck driver, which comprised both Department of Transportation testing and non-Department of Transportation testing, did not identify any tested-for substances.¹⁴

1.4 Private Grade Crossing Description

The private grade crossing where the accident occurred is located in the Cleveland Belt Subdivision within NS's Keystone Division. Division track extends from the NS Campbell Road Yard to multiple industries in the Cleveland area. The road leading to the crossing met the crossing at an approximate 45° angle (not perpendicular) where the accident occurred. The crossing was equipped with railroad crossbucks and stop signs facing both directions of approach.

1.5 Sight Observations

NTSB investigators conducted sight-distance observations at the private grade crossing. Visibility assessments were performed from the cab of the dump truck to determine the approximate field of view that the driver would have had at the time of the accident. The NTSB's assessment showed that from the location the dump truck stopped at the stop sign near the grade crossing on the night of the accident, the field of view

¹² (a) Postaccident toxicology testing required by the FRA includes testing for amphetamines, barbiturates, benzodiazepines, cannabinoids, cocaine, MDMA/MDA, methadone, opiates/opioids, phencyclidine, tramadol, ethyl alcohol, brompheniramine, chlorpheniramine, diphenhydramine, doxylamine, and pheniramine.

¹³ The Federal Aviation Administration Forensic Sciences Laboratory tests specimens for over 1,300 compounds including toxins, prescription and over-the-counter medications, and illicit drugs.

¹⁴ In accordance with 49 *CFR* 40.82, tested-for substances included amphetamine/methamphetamines, methadone, fentanyl, tramadol, zolpidem, buprenorphine, propoxyphene, barbiturates, and ketamine.

afforded to investigators allowed about 38 feet along the railroad track to the right of the crossing. The train was traveling about 9 mph (13.2 feet per second).

1.6 Regulations, Rules, and Guidance

Railroads are governed by federal regulations and by their own operational rules. Included in this guidance are requirements for shoving, pushing, and operation at grade crossings.

1.6.1 FRA Regulations for Shoving or Pushing

FRA regulations state that the only time a shoving movement shall enter a grade crossing where stopped or approaching traffic is present is when the crossing has crossing gates that are in the fully lowered position or when an employee is flagging the crossing.¹⁵ Further, there are regulations for operating when the “track is clear” as related to a highway grade crossings. In this context, the phrase “track is clear” does not necessarily refer to vehicles on the track, it also applies to oncoming vehicles or vehicles sitting at a crossing that has no crossing protection.

1.6.2 FRA Grade Crossing Handbook

The FRA recommends that every effort should be made to construct a grade crossing with a 90° intersection of track and highway.¹⁶

The FRA advises that if an intersection between the track and road cannot be made at right angles, the variation from 90° should be minimized. The FRA also advises that special consideration should be given to grade crossings that have unsafe horizontal geometries. These grade crossings warrant additional safety measures, such as the installation of active traffic control systems.

1.6.3 NS Operating Rules

According to NS Operating Rule 120–Cars Not Headed By an Occupied Engine over a Highway-Rail Grade Crossing, when cars not headed by an occupied engine are moved over a grade crossing, a member of the crew must be on the ground at the grade

¹⁵ In accordance with 49 *CFR* 218.99(e)(4)(iv).

¹⁶ FRA. Railroad-Highway Grade Crossing Handbook. 3rd Edition. July 2019.

crossing to warn traffic until the leading end has passed over the crossing.¹⁷ Rail movements over the grade crossing are allowed only “on proper signal from the employee.” The rule has four exceptions, wherein these actions are not required:

1. Crossing gates are in the fully lowered position, and are not known to be malfunctioning; or
2. The crossing is equipped with flashing lights, crossbucks, or stop signs and it is clearly seen that no traffic is approaching or stopped at the crossing, and the leading end of the movement over the crossing does not exceed 15 mph; or
3. A qualified employee, other than a crewmember, with the ability to communicate with trains is stationed at the crossing to warn traffic; or
4. The crossing has been rendered inaccessible to highway motor vehicles.

1.6.4 Stein LLC Code of Conduct

Stein LLC has guidance on railroad safety, which reads in part: “Trains have the right of way—you and your piece of equipment are “trespassing” when you enter working areas around tracks or move over a crossing.”¹⁸

1.7 Postaccident Actions

After this accident, NS issued a serious incident notice to employees describing the accident. The notice discussed the importance of pausing to identify risks, processing information to choose the safe course of action, and proceeding in a safe manner. The notice also emphasized adherence to NS Operating Rule 120, requiring a member of the crew to be on the ground at the grade crossing to warn traffic until the leading end has passed over the grade crossing.

Cleveland-Cliffs took action to improve the safety of the crossing by altering the road so that it is closer to a 90° angle with the tracks, as well as adding additional stop signs, crossbucks, and portable light towers. Before railroad operations started back up, Stein LLC site management met with Stein LLC employees who worked in this area and reiterated the company’s rail safety practices and procedures and commitment to safety. Stein LLC also audited and surveyed all rail crossings in the Cleveland-Cliffs steel plant and shared its findings with Cleveland-Cliffs. Further, Cleveland-Cliffs is exploring more

¹⁷ NS Operating Rules, Effective January 1, 2019.

¹⁸ Stein LLC, Railroad Safety.

robust enhancements to the crossing and has brought in an engineering firm to provide help.

Finally, as a result of this accident, on March 16, 2023, the FRA issued "Safety Bulletin 2023-02: Highway-Rail Grade Crossing and Shove Movement Accident." The Safety Bulletin discusses the importance of proper training, oversight, job briefings, and crew communication to provide safety at grade crossings and reminds railroads of the need to ensure all individuals involved in pushing or shoving movements understand what "track is clear" means related to grade crossings.¹⁹

2 Analysis

In this accident, the conductor of train C75B106 was killed while performing a shoving movement at a private grade crossing in Cleveland, Ohio. The conductor was riding the lead railcar during a shoving movement when he was pinned between the train he was riding and a dump truck as the vehicle and train simultaneously entered the private grade crossing.

The grade crossing was equipped with passive warning devices that included railroad stop signs and crossbucks facing both directions of approach. Train C75B106 was traveling about 9 mph as it approached the crossing. At the same time, the dump truck approached the grade crossing and stopped, yielding to trains as required. The driver then proceeded into the grade crossing where the accident occurred. It was not until the driver entered the grade crossing that he detected train C75B106 approaching.

According to NS Operating Rule 120, when railcars not headed by an occupied engine are moved over a grade crossing, meaning shoved, a member of the train crew must be on the ground at the grade crossing to warn traffic until the leading end has passed over the grade crossing. In this accident, the railcars were not headed by an occupied engine because the NS crew was engaged in a shoving movement. Therefore, to comply with this rule during the shoving movement, the conductor would have needed to dismount and direct the train over the grade crossing from the ground. After the accident, NS issued a serious incident notice to employees describing the accident, emphasizing adherence to NS Operating Rule 120, and discussing the importance of pausing to identify risks. The FRA issued a safety bulletin discussing the accident, stressing the importance of communication, and reminding railroads of the need to ensure all individuals involved in pushing or shoving movements understand what "track is clear" means related to grade crossings.

¹⁹ The full text of the advisory is accessible at: <https://railroads.dot.gov/sites/fra.dot.gov/files/2023-03/Safety%20Bulletin%202023-02%20%28031623%29.pdf>.

The NTSB has investigated similar accidents in Northlake, Illinois, and Houston, Texas.²⁰ In both these accidents, the train crews had not provided ground protection for shoving movements through passive grade crossings and the railroad workers riding the movement were killed. As a result of the Houston, Texas, accident in October 2023, the NTSB identified the need to prohibit railroad employees from riding shoving movements through grade crossings equipped only with flashing lights or passive warning devices without ground protection. The NTSB believes that ground protection provided by train crews reduces the risk of a collision. The purpose of ground protection is to provide safety controls to assure safe movement across the grade crossing by having someone on the ground who can provide an unobstructed view to monitor traffic from both directions and relay movement information to the engineer. The NTSB recently recommended the FRA revise its regulations to require ground protection when conducting shoving movements through grade crossings equipped only with flashing lights or passive warning devices (R-23-19). The status of recommendation R-23-19 is Open–Await Response. The NTSB also recommended that the General Code of Operating Rules Committee, the Northeast Operating Rules Advisory Committee, Canadian National Railway, and the Norfolk Southern Corporation revise their operating rules to prohibit railroad employees from riding shoving movements through grade crossings equipped only with flashing lights or passive warning devices unless ground protection is provided (R-23-20). The status of recommendation R-23-20 is Open–Initial Response Received. The NTSB recommended that the American Short Line and Regional Railroad Association advise its members of the circumstances of this accident and the NTSB’s recommendation to require ground protection at grade crossings equipped only with flashing lights or passive warning devices (R-23-21). The status of recommendation R-23-21 is Closed–Acceptable Action.

The NTSB observed that the field of view, because of the acute angle of the crossing with respect to the road, was about 38 feet down the railroad track in the direction of the oncoming train, train C75B106. Had this been the perspective of the driver, then the train was likely out of his view when he made the decision to proceed and cross the tracks. After the accident, Cleveland-Cliffs improved the design of the grade crossing by altering the road so that it is closer to a 90° angle and reducing the acute angle with the tracks and installed additional stop signs, crossbucks, and portable light towers. Cleveland-Cliffs continues to explore potential enhancements to the private grade crossing.

²⁰ (a) NTSB. 2021. Union Pacific Railroad Employee Fatality, Northlake, Illinois, April 23, 2020. RAB-21-04. Washington, DC. (b) NTSB. 2023. Watco Dock and Rail, L.L.C. Employee Fatality, Houston, Texas, October 29, 2021. RIR-23-04. Washington, DC.

3 Probable Cause

The National Transportation Safety Board determines that the probable cause of the March 7, 2023, Norfolk Southern Railway employee fatality was the crew not following Norfolk Southern Operating Rule 120 requiring a member of the crew to be on the ground at the private highway-railroad grade crossing to warn traffic. Contributing to the accident was the design of the intersection at the private highway-railroad grade crossing preventing adequate sight distance for the driver to be able to determine if it was safe to cross the tracks.

The NTSB is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in the other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

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 Case Analysis and Reporting Online \(CAROL\) website](#) and search for NTSB accident ID RRD23LR007. 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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