CLEVELAND-CLIFFS CLEVELAND WORKS LLC[1]

Before the National Transportation Safety Board

NTSB Accident Number: RRD23LR007

Class: Regional

March 7, 2023

Proposed findings, probable cause, and safety recommendations in connection with the Norfolk Southern Railway employee fatality that occurred while performing a shove movement during industrial switching operations near Cleveland, Ohio on March 7, 2023.

FINAL SUBMISSION

Donald Westerhoff

Dated: October 30, 2023

[1] Cleveland-Cliffs Cleveland Works LLC is the owner and operator of the steel mill where this incident occurred. Its ultimate parent company is Cleveland-Cliffs Inc.

A. ACCIDENT

Location: Cleveland, OH

Date: March 7, 2023

Time: 1:08 a.m. Local time
5:08 a.m. Universal time

Train: C75B106 Norfolk Southern Railway

B. SUMMARY

At approximately 1:08 a.m. local time on March 7, 2023, a Norfolk Southern Railway (henceforth referred to as NS, or Norfolk Southern) conductor on NS train C75B106 was killed when the train on which he was riding collided with a dump truck as they simultaneously entered a private grade crossing in the Cleveland-Cliffs Cleveland Works LLC steel plant in Cleveland, Ohio. The dump truck was a Caterpillar 769, a 35-ton off-road dump truck. At the time of the accident, the truck bed was partially filled with limestone. The truck is approximately 12 feet 2 inches high and was struck by the train at an angle causing damage to the right front corner of the truck. The conductor was riding on the platform of the leading residue tank railcar during a shoving movement when he was crushed between the railcar and the dump truck during the collision. The conductor was using a lantern which was illuminated at the time of the accident.

The crew of train C75B106 consisted of an engineer in the locomotive cab 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 dump truck was driven by a Stein, LLC employee and was hauling limestone at the time of the collision. Cleveland-Cliffs Cleveland Works surveillance camera data show the dump truck traveling southwest on the dirt/gravel haul road through the plant, stopping prior to entering the private grade crossing, and then proceeding through the crossing. The truck driver said that he did not see the train. The train was traveling approximately 10 mph at the time of the collision; the maximum authorized timetable speed

within the steel plant was 10 mph. The private grade crossing where the accident occurred was controlled by crossbucks and stop signs facing both directions of approach. Prior to the accident, the truck driver was aware of the stop signs and the presence of the railroad tracks and had accomplished several trips across the railroad tracks earlier that shift. The immediate area of the private grade crossing is illuminated by a single light pole, on which 2 of the 4 lights were operational at the time of the incident. The dump truck is equipped with headlights and two yellow flashing LED lights on each side of the truck, which were operational at the time of the incident. The conductor was wearing a reflective vest over a hooded raincoat/jacket. The conductor was holding an LED lantern at the time of the incident. The dark grey/black tank car on which the conductor was riding had no other means of illumination but was equipped with reflective tape on either side of the tank car.

C. OPERATIONS

1. **NS Operating Rule 120.** The NS Railway has specific rules and guidelines in place concerning the performance of shoving movements over certain highway/railroad crossings. These rules and guidelines are outlined in NS rule 120 and state in part:

   A. *When cars not headed by an occupied engine are moved over a:*

   - *public crossing*
   - *private crossing located outside the physical confines of a rail yard*
   - *pedestrian crossing located outside the physical confines of a rail yard*
   - *yard access crossing*

   A member of the crew must be on the ground at the crossing to warn traffic until the leading end has passed over the crossing.

   Rail movements over the crossing will be made only on proper signal from the employee.

   These actions are not required if the crossing is clear, and:

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.*

2. **Stein, LLC.** The dump truck involved in the collision was operated by Stein, LLC. Stein has guidance and internal rules concerning railroad safety for their employees. These internal rules include the following bullet points which are pertinent to this accident:

    - *Trains do not travel on a predictable schedule – even though it may seem that way inside the mill. Always expect a train at every crossing.*
    - *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.*
    - *Trains can move in either direction at any time. A string of railcars can be pushed or pulled – even if you cannot see a locomotive, cars may still be in motion.*

    And finally,

    - *Certain crossings may be obstructed or the sight lines may be limited – especially depending on the piece of equipment you are operating. <u>Position your piece of equipment before the crossing to provide the best line of sight.</u> Observe the track line before you reach a crossing – that may give you the best view of any railroad traffic that is approaching.* (Emphasis added)

Post-accident investigations at the accident site revealed that the Stein dump truck had a limited, angled view of approaching railroad traffic at the private grade crossing where the accident occurred (*see* **Figure 1**).

Figure 1 – A post-accident re-enactment view based on the "estimated" stopped position of the Stein dump truck, as determined by NTSB, from the perspective of the driver's seat. The arrow depicts the angle of approach of the NS C75B106's train *(Photo courtesy of NTSB)*

3. **Cleveland-Cliffs Cleveland Works LLC:** Stein is an embedded contractor at Cleveland-Cliffs Cleveland Works. As a contractor, Stein and its employees are responsible for their own safety. Cleveland-Cliffs Cleveland Works provides safety standards and rules for contractors to which contractors are expected to adhere. Cleveland-Cliffs Cleveland Works contractors must acknowledge and follow the requirements stipulated in the "Cleveland-Cliffs Contractor Safety Handbook" and standards. Cleveland-Cliffs Cleveland Works provides an annual meeting with contractor representatives which includes a review of the "Cleveland-Cliffs Contractor Core Training." This training summarizes safety expectations and the requirements of Cleveland-Cliffs' standards. Stein representatives must provide

and acknowledge the completion of "Cleveland-Cliffs Contractor Core Training" to Stein personnel.

NS is not a contractor for Cleveland-Cliffs Cleveland Works. Service providers, such as NS, which perform work on the Cleveland-Cliffs Cleveland Works property, are independent and separate from Cleveland-Cliffs Cleveland Works operations. Service providers such as NS are not considered contractors and would not be included in contractor training.

There are two sets of rail lines operating on Cleveland-Cliffs Cleveland Works' facility. They are generally referred to as CWRO tracks and NS tracks. NS only operates on NS tracks, but there is an interchange at the NS Campbell Road Yard.

NS services the Cleveland-Cliffs Cleveland Works using the NS tracks. With regard to the operations of the steel mill, NS brings raw materials into and ships finished goods from Cleveland-Cliffs Cleveland Works. In addition, NS also services other customers using its tracks and its right-of-way located on the Cleveland-Cliffs Cleveland Works property. It passes through the Cleveland-Cliffs Cleveland Works facility in servicing other customers.

D. PROPOSED FINDINGS

Cleveland-Cliffs Cleveland Works disagrees with several proposed findings, characterizations and conclusions:

1) <u>The crossing and the road</u>

Stein sent an email to NTSB summarizing their post-accident actions, the body of which reads:

"After the accident, Stein asked Cliffs to remove a concrete structure that prevented us from crossing the NS rail crossing at a 90 degree angle. It was about 15'x10'x5' and looked like it was a foundation of an old building that is no longer there. The attached picture is a Google Maps screenshot from before the structure was removed. I circled the structure in red that was removed and the blue roadway shows the new crossing angle for the track if traveling from east to west. Since Cliffs made this change and added additional lighting, our equipment operators' line of sight in the area of the NS track has improved. Prior to operations starting back up, Stein site management met with Stein employees who worked in this area and reiterated the company's rail safety practices and procedures and commitment to safety. Stein also audited and surveyed all of the rail crossings within the Cleveland plant post-accident and shared its findings with Cliffs."

[Stein figure.]

Cleveland-Cliffs Cleveland Works disagrees with certain critical characterizations in Stein's email. The above image was provided by Stein, which shows an aerial

view of the crossing where the incident occurred. The red circle identifies the concrete foundation of an electrical vault bypass to the east of the railroad track. The road that the Stein trucks travel after picking up a load of raw materials was drawn in blue by Stein. While the removal of the concrete foundation helps to achieve an improved angle of approach, this alignment represented by the blue lines was possible prior to the removal of the foundation. The presence of the concrete foundation did not impede Stein trucks from being able to maneuver their trucks to be able to achieve a near perpendicular angle of approach to the private grade crossing, allowing for improved field of view of the railroad tracks. [See Figures 2 and 3 below]

Figure 2 (from Google Earth). The square structure does not interfere with this approach.

Figure 3 (from Google Earth). The green arrows depict the travel path that Stein vehicles use from the Raw Material Stockpile. The red closed circles depict the Old Bottle Repair Road which converges onto the haul road. The Old Bottle Repair Road was not being used by Stein at the time of the incident.

2) Ownership of the crossing

Cleveland-Cliffs Cleveland Works disagrees with NS' conclusion that Cleveland-Cliffs Cleveland Works owned/controlled the private grade crossing. Ownership and control of private grade crossings is often governed by an agreement between the parties. The NS tracks and crossing in question were in place at this facility decades before Cleveland-Cliffs Cleveland Works acquired ownership of the steel plant. Cleveland-Cliffs Cleveland Works does not have access to all of the historical documents of predecessor companies or other previous owners of the facility. NS baldly states the crossing was owned by Cleveland-Cliffs Cleveland Works LLC but does not provide any authority for this proposition. Therefore, legal ownership and control of the crossing is still an open question.

E. ADDITIONAL CONSIDERATIONS

Stein Truck Position and Nonrecognition of NS Shove Movement

The field of vision of the Stein truck driver at the private grade crossing is affected by a number of factors, including the position and orientation of the truck relative to the private grade crossing and the body positioning of the truck driver as he looks to his right or left. This is due in part to the partially obscured view looking out of the right side of the cab given the presence of truck components (pre-cleaners, exhaust, fire extinguisher, and structure of the dump bed). See Fig.4

Figure 4 The view from operators' seat of the Caterpillar 796 (looking to the right)

As noted in Section 8.0 Grade Crossing Visibility Observations of the NTSB System Safety Group Report (RRD23LR007), approximate field of view determinations were made as part of the investigation and took into consideration both conservative and estimated truck positions (herein referred to as the "Conservative Position" and the "Estimated Position"). At the Conservative Position, the Stein driver stopped at or

parallel to the stop sign. At the Estimated Position, the Stein driver stopped several feet beyond the stop sign, and closer to the NS tracks.

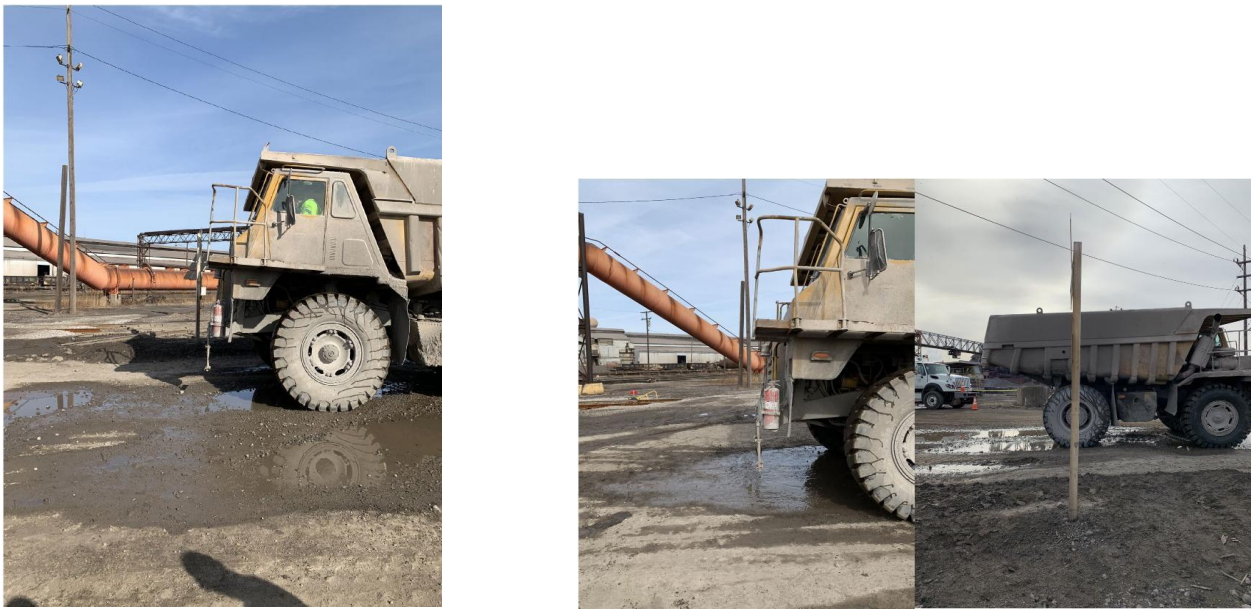

Figure 5 The photo on the left represents NTSB's Conservative truck position (stopped at or parallel to the stop sign) while the photos on the right represent NTSB's Estimated truck position (stopped several feet beyond the stop sign).

Based on those field of view determinations, and time stamped transcription of security video and locomotive event recorder data, the following analysis is provided:

It is noted that the Stein truck comes to a complete stop at 1:08:27, at which time the NS locomotive was operating at approximately 10 mile per hour (mph) or 14.667 feet per second (fps).

(10 mph)(5280 ft/mile) / (3600 sec/hr) = **14.667 fps**

Based on measurements made by NTSB (See Fig. 6), if the Stein driver stopped at the Conservative Position and leaned forward to improve his field of vision

given the partially obscured view out of the right cab window, the driver would have been able to see approximately one hundred fifteen (115) feet down the track.

NTSB also estimates that if the Stein driver stopped at the Estimated Position, the driver would have been able to see approximately thirty-eight (38) feet down the track, assuming that the driver did not lean forward to garner an improved field of vision.

NTSB further concludes that from the Estimated Position, the driver would have been able to see approximately fifty-two (52) feet down the tracks, if he had leaned forward in the cab of his truck to see between the truck components that partially obscure the view out of the right side of the cab.

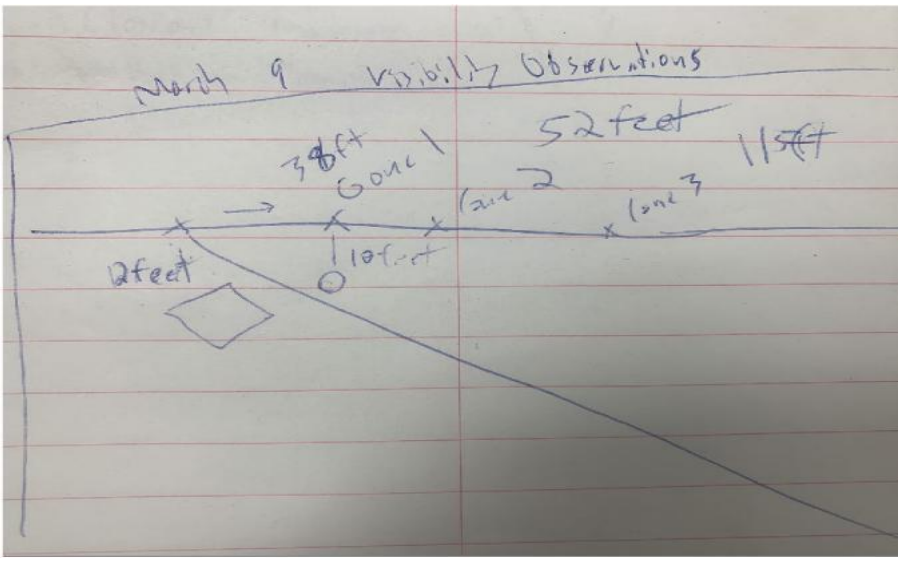

Figure 6. The above figure is a photo of a hand drawn sketch by the System Safety Group Chairman. The rail is depicted by a horizontal line, and the road is depicted by an angled line that intersects it from below. Three cones were placed to indicate measurements from the crossing, as described in Section 8.0 of NTSB's System Safety Group report. The square represents the truck, and the circle represents the stop sign with crossbucks. Note that the figure is not drawn to scale.

Available video surveillance indicates that the truck driver comes to a complete stop at 1:08:27 and is stopped for five (5) seconds before proceeding. The video then shows the truck begins to move at 1:08:32 and the collision occurs at 1:08:35, or approximately three (3) seconds after proceeding from the stopped position. Thus there was a total of eight (8) seconds from when the Stein driver stopped the truck to when the collision occurred.

Based on this time determination, the NS train would have been approximately 117.36 feet from the point of impact and just starting to enter the Stein drivers' field of vision at the point that the truck stopped, assuming the driver was looking down the track.

(8 sec.)(14.667 ft/sec) = **117.36 feet**

As calculated, when the Stein driver stopped, the train was approximately 117.36 feet from the point of impact. During the 5 seconds the driver was stopped, the train continued to operate at approximately 10 mph and traveled approximately 73.34 feet.

(5 sec.)(14.667 ft/sec) = **73.34 feet**

Given the 73.34 feet that the train traveled in the approximate 5 seconds that the Stein driver was stopped, the train would therefore be approximately 44.02 feet from the point of impact when the driver started to resume driving from the estimated stopping point.

117.36 feet – 73.34 feet = **44.02 feet**

From the Estimated Position, where NTSB estimated the Stein driver stopped he would have been able to see 52 feet down the track, if he had leaned forward to look between the exhaust and the bed of the truck. He therefore would have been able

to see the train. However, had the driver failed to lean forward, his field of vision based on NTSB measurements, would have only been approximately 38 feet down the track, in which case he might not have been able to see the train at the moment the truck began to move from a stopped position.

From the Conservative Position, his field of view would have been 115 feet north along the NS track. At 1:08:27, the point when the truck stops, the NS lead rail car traveling at 10 mph would have been 117.36 away. During the approximately 5 seconds that the truck remained stopped, the train would have travelled 73.34 feet, which was well within the field of vision of the driver, even at the acute angle suggested by the conservative truck position in the NTSB report.

NS Conductor Nonrecognition of Stein Truck

Recorded radio communications between the NS Conductor and Engineer, as well as interview excerpts from the NS Engineer, suggest that the conductor provided a command to "keep em' coming" seconds prior to impact. The "keep em' coming" command was immediately followed by a "that'll do, that'll do" command which is an emergency stop (full service and independent brake) command that would appear to suggest the recognition of the truck movement toward the private grade crossing just after a command to continue with the shove movement. The conductor was positioned on the left (east) side of the platform of the lead tank rail car. In this position, his likely orientation was facing in a southernly direction. The Stein truck approached the private grade crossing from a northeasterly direction, which would have required the conductor to look to his left or over his shoulder (in an east/southeast direction) as the Stein truck and NS train converged toward the crossing.

Another possibility is that the NS Conductor gave an errant command to "keep em' coming" despite the presence of a stopped vehicle at an unprotected private grade crossing, which

under normal circumstances, would necessitate stopping and providing protection as per NS Rule 120.

Finally, consideration for normalization of deviance, a process by which deviance from correct or proper procedure or behavior becomes accepted or normalized, should be considered as a potential contributing factor. Interview statements suggest that the crossing is commonly void of any vehicular traffic. Repeated successful navigation of the crossing in the absence of any vehicular traffic may have provided a false sense of security and a belief that on this particular approach to the crossing, a similar condition (the absence of any vehicular traffic) would be the expected outcome.

Acute Angle of Approach of Roadway in Relation to the Railroad Tracks

The existing gravel/dirt haul road that Stein uses to transport raw materials to the Blast Furnace is approximately 57 feet wide at the point of the private grade crossing. This road is limited primarily to haul trucks and occasional service provider trucks and is not a common roadway for employee transport or common mill traffic aside from raw material related transport and service. Although the haul road is not delineated other than by past roadway grading/maintenance practices and existing wear patterns, the driver must determine the necessary angle of approach. The two-way haul road runs in a northeasterly to southwesterly direction while the NS truck is in a north/south configuration. This configuration results in the haul road intersecting with the NS track at a potential acute angle (approximately 45°). Given the width of the roadway, trucks have the ability to maneuver to achieve a more perpendicular alignment with the railroad tracks.

Railroad Shove Movements and Visibility

Railroad shove movements require the positioning of the conductor on the front of the lead railcar to protect the lead end and to communicate accurate instructions to provide control of the movement. This positioning exposes the conductor to several inherent hazards.

Lead rail cars are far less visible than locomotives, which are equipped with headlights, audible horns, and other sensory inputs that are detectable to motorists and pedestrians. In this incident, the lead tank railcar was dark grey/black in color and, aside from retro-reflective tape on the right and left sides of the railcar, was absent any illumination other than the lantern held by the conductor and the reflective vest worn by the conductor. The reflective tape on the sides of the railcars would have provided little to no reflectivity due to the absence of any direct light shining onto the reflective surface given the Stein dump trucks orientation. Evidence indicates that the conductor was in possession of the lantern during the shove movement and it was illuminated. Prior precipitation and the presence of puddles and wet surfaces may have also contributed to some degree of light scattering and created a monochromatic landscape.

Truck Driver Schedule

While the investigation did not reveal any known driver distractions or impairment, it is noted that the work schedule records of the Stein driver indicated he worked at least 14 consecutive days. In the 12 days prior to the incident, the driver worked a total of 119.5 hours which included two 8-hour shifts, two 12-hour shifts, and one 14.5-hour shift in the 5 days preceding the incident. While not documented within the NTSB reports, it's conceivable that this work schedule could have contributed to some reduced cognitive processing.

Train Schedule

The NS rail crossing is not a frequently used track (typically twice per night). The Stein driver successfully navigated the crossing several times on the evening of the incident and it is possible that the absence of prior rail traffic on the NS track during previous trips may have produced the perception that the subsequent crossing would also be void of any rail

traffic and lulled the driver into a complacent approach to acquiring the necessary field of vision needed to ensure a clear passage through the grade crossing.

F. POST INCIDENT ACTIONS AND PROPOSED RECOMMENDATIONS

Cleveland-Cliffs Cleveland Works Post Incident Actions:

Following the incident the following enhancements were made to the area of the rail grade crossing:

- An additional stop sign and crossbuck sign was installed on the north side of the haul road (east of the NS tracks).
- The concrete electrical vault foundation to the East of the NS Tracks was demolished to provide additional space along the haul road.
- Jersey barriers were installed along the right (north side) of the haul road to better delineate the roadway. Jersey barriers were also installed around the guidewires for the electrical power lines that are located to the east of the NS track adjacent to the left (south side) of the haul road.
- Supplemental lighting consisting of two (2) telescoping light stands were positioned at the NS grade crossing (one on the east side, and one on the west site) to supplement existing lighting.

Anticipated Future Enhancements:

In an effort to further improve the general area of the haul road and associated private grade crossings in the area, Cleveland-Cliffs Cleveland Works engaged in a Middle Dock Crossing Capital Improvement Plan that will require future coordination with NS. This plan consists of the following:

- Contracted an engineering firm to propose and design a new private grade crossing, including the NS Track and the four CWRO tracks associated with the

Middle Dock area. It is anticipated that this will include active rail crossing controls (automatic railroad control arms/gates, flashing lights, and an audible signal)

- Contracted a company to design the electrical infrastructure and requirements for the private grade crossing signals and gate mechanisms.
- Purchasing new active signals and gate mechanisms to replace current passive stop signs and crossbuck signs.
- Conducted a light study in the area to determine additional illumination needs.
- Investigating necessary actions to remove or relocate guide wires for existing utility pole to the east of the NS track.

Additional Discussions with NS and Stein:

Explore the possibility of the following with NS:

- Coordinate and provide necessary technical expertise related to equipment, technology, operating guidelines, etc. related to proposed active private grade crossing system and provide necessary crews and personnel to perform necessary work on NS tracks to facilitate installation of active private grade crossing equipment on Cleveland-Cliffs Cleveland Works' property.
- Investigate notification of Cleveland-Cliffs Cleveland Works Yard Master prior to future shove movements to facilitate crossing protection until active crossing measures are installed.
- Request NS to develop and implement a program to educate train crews regarding hazards and appropriate safe work practices, including but not limited to, inherent risk of shove movements, proper 3-way communication between train crews, and NS Operating Rule 120.

- Implement auditing program to assess compliance with Norfolk Southern Railway with particular focus on compliance regarding NS Rule 120.

Explore the possibility of the following <u>with Stein</u>:

- Continue regular training on safe operation of mobile equipment that includes a review of railroad safety and appropriate safe work practices when interacting with railroad and other mill traffic including but not limited to, the importance of Stop, Look, and Listen at all railroad crossings, obtaining necessary line of site, railroad right of way, close clearances, and a review of the Cleveland-Cliffs Railroad Safety Standard.
- Implement auditing program to assess compliance with Stein rules and applicable Cleveland-Cliffs Safety Standards and ensure any findings or nonconformance issues are addressed through the successful implementation of corrective actions.
- Investigate and determine feasibility of other enhancements to vehicles to improve detection and/or improve visibility associated with compromised field of vision or blind spots, including but not limited to railroad crossings, pedestrian areas, close clearances, through camera and monitoring systems (See Fig. 7), presence sensing equipment, or other applications related to heavy equipment operations.

Figure 7 Example of added camera and monitor to help assist in field of vision.

Respectfully,

/s/ Donald Westerhoff

DONALD WESTERHOFF, CSP
Program Director Compliance Assurance
P [redacted]
[redacted]

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CERTIFICATE OF SERVICE

I certify that on October 30, 2023, I have electronically served upon Mr. Gregory Scott ([redacted] Investigator in Charge, National Transportation Safety Board, a complete and accurate copy of these proposed findings regarding the March 7, 2023, NS employee fatality that occurred while performing a shoving movement over a highway/railroad grade crossing within the Cleveland-Cliffs, Inc. industrial facility (RRD23LR007). An electronic copy of same was also forwarded to the individuals listed below in this certificate of service, as required by 49 CFR § 845.27 (Proposed Findings):

Mr. Gregory Scott
Investigator-in-Charge, RRD23LR007
National Transportation Safety Board
490 L'Enfant Plaza, SW
Washington, DC 20594
Email: [redacted]

Michael Alamprese, FRA
Operating Practices, Inspector
Email: [redacted]

David Gooden, NS
Operations
Email: [redacted]

Rocky Agozzino, Stein, LLC
Email: [redacted]

L. Randy Fannon
Brotherhood of Locomotive Engineers & Trainmen
Email: [redacted]

Joseph Ciemny, SMART-TD
Investigator – SMART-TD National Safety Team
Email: [redacted]

/s/ Donald Westerhoff

DONALD WESTERHOFF, CSP
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