

# National Transportation Safety Board

Office of Railroad, Pipeline and Hazardous Materials

Washington, DC 20594



RRD24FR009

## **OPERATIONS WORKING GROUP**

Group Chair's Factual Report

June 1, 2024

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**A. ACCIDENT**

NTSB Accident No: RRD24FR009  
NTSB Keys number:193868  
Accident Type: Train collision and derailment  
Location: Easton, Pennsylvania  
Date of accident: March 2, 2024  
Time of accident: 7:11 am  
Carrier: Norfolk Southern  
Train type/Designation:  
Train 1: 268H429 (Striking train)  
Train 2: 24XH101 (Struck train)  
Train 3: 19GH501(Accident train)

Fatalities: 0  
Injuries: 7

**B. OPERATIONS WORKING GROUP**

NTSB	R. Skolnekovich Rail Accident Investigator Washington, DC
Federal Railroad Administration	Josh Quillen Operations Safety Inspector Philadelphia
Norfolk Southern	Don Craine Superintendent Enola, PA
BLET	Gw Scott Brown BLET Safety Tack Force Easton, PA
SMART	Ronald E. Sabol SMART-Investigator Trenton, NJ

## **C. ACCIDENT SUMMARY**

For a summary of the accident, refer to the accident summary report, within this docket<sup>1</sup>.

## **D. DETAILS OF THE INVESTIGATION**

### **1.0 Description of the Lehigh line.**

The NS Lehigh Line is part of the NS Keystone Division, Allentown Road subdivision and extends from Port Reading junction, New Jersey (NS milepost LE 36) to Weatherly, Pennsylvania (NS milepost LE 130.6) in a timetable east-west direction. This line consists of both single and double track with a maximum authorized timetable speed of 50 mph for freight trains unless otherwise restricted.

The method of operation at the point of collision and derailment on the Lehigh line is a combination of Positive Train Control (PTC) and Norfolk Southern operating rule 261 on main tracks 1 and 2 with wayside signal indication as the authority for a train to operate in either direction on the same track in this territory. Maximum authorized speed on the Lehigh line is 50 mph. The maximum authorized speed on Main track 1 and 2 is 40 mph at the accident location (MP LE 83.7). At the time of the accident, westbound Train 19G was limited to a maximum authorized speed of 30 mph. due to a degrading signal progression ahead. This speed restriction was being enforced by the locomotive onboard PTC system.

### **2.0 Accident Site**

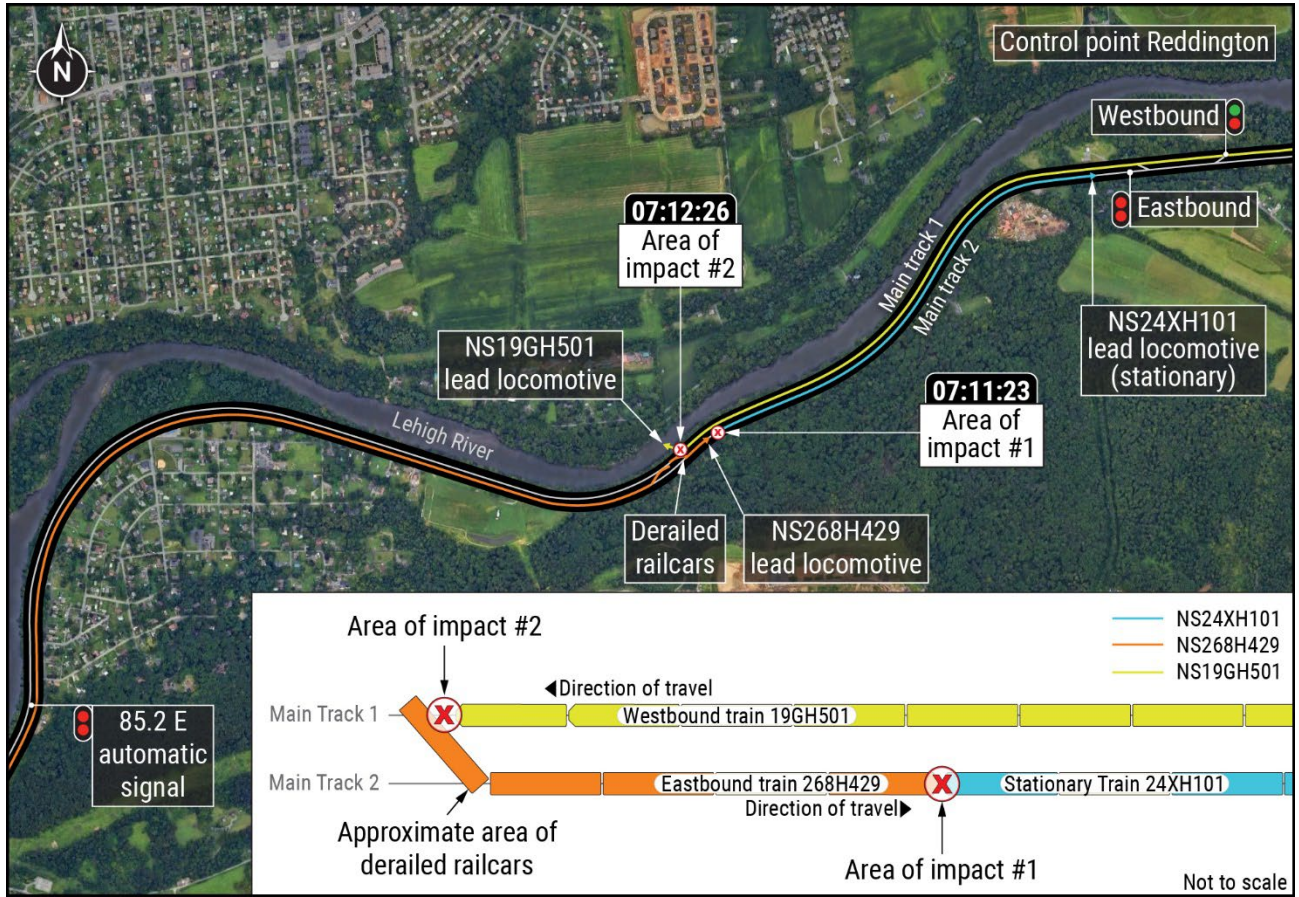
#### **2.1 Description**

The collision occurred on a four-degree tangent track that runs parallel the Lehigh river. The grade at the accident location was reported as a .21-degree grade approaching the accident site and continued into river grade at the point of the collision. Significant train wreckage and steep terrain provided limited access to the track infrastructure for conducting sight distance measurements. Initial sight distance estimate of the striking train to the struck train was 150-250 feet (or 3-5 cars).

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<sup>1</sup> The accident summary report can be found at the following location:  
[HTTPS://data.nts.gov/Docket/?NTSBNumber=RRD24FR009](https://data.nts.gov/Docket/?NTSBNumber=RRD24FR009)

## 2.2 Aerial Picture with Derailment Illustrations



## 2.3 Derailment Pictures



### 3.0 Train locomotives and consist information.

SYMBOL	LEAD	TRAIL 1	TRAIL 2	DPU/POS	TONS	LENGTH
24XH101	NS4713	NS7558	NS4710		3,079	4,386
268H429	NS9906	NS3625			5,847	7,364
19GH501	NS8157	NS9891		NS4467/106	15,137	13,162

### 3.1 Train departure/destination information.

Train symbol	Departed	Destination
24XH101	Atlanta, Georgia	Croxtan, New Jersey
268H429	Landers Illinois	Elizabeth, New Jersey
19GH501	Croxtan, New Jersey	Enola, Pennsylvania

### 4.0 Lead Locomotive Event Recorder review.

Event recorder data reviewed by the operations group included the following locomotives:

- NS9906 which was the leading unit from train 268H (Striking train).
- NS4713 which was the leading unit from train 24X (struck train).
- NS9891 which was the trailing unit from train 19G (accident train).

During the event recorder review, the Operations Group noted that event recorder table data from all units reviewed included GPS times, distance measurements and Norfolk Southern timetable milepost locations. The parties agreed that this data was accurate and would be used as the official times and locations for the following events.



#### 4.1 NS9906- Lead unit of NS268 (striking train)

TIME	LE MP	PTC SPD	SPEED LIMIT	THR	DYN	BP	BC	SIGNAL
07:03:00	86.17	19.96	30		3		0	AP
07:04:28	85.74	15.7	19	IDLE			0	REST
07:08:28		16.58	19	1		90	0	REST
07:09:18	84.34	16.92	19	IDLE			0	REST
07:09:44	84.21	16.91	19		1		0	REST
07:11:04	83.84	15.53	19		3		0	REST
07:11:05	84.07	15.54	19		8		0	REST
07:11:07	83.83	15.3	19			3	21	REST
07:11:21	83.7784	12.86	19					REST

#### 4.2 NS4713- Lead unit of Train 24X (struck train)

TIME	LE MP	PTC SPD	LIMIT	TH	DYN	BP	BC	Notes
07:11:00	82.9705	0	0			69	73	Stop signal.
07:11:23	82.9705	0	0					Impact time from train 268.
07:11:25	82.9705	4.74	0					Top speed after collision
07:11:31	82.967	0	0					Total distance travelled after impact was 26 feet.

#### 4.3 NS9891- Trailing unit of Train 19G (accident train)

TIME	LE MP	PTC SPD	LIMIT	TH/DYN	BP	NOTES
07:12:03		28.83	30	EMS	90	Passing 268 leading unit
07:12:04		28.83	30	N/A	81	EIE is initiated
07:12:05	76.2352	29.85	30	N/A	9	19G at full braking potential.
07:12:26	76.3213	22.4	30	N/A	0	Impact- Travel distance of 545' after Engineer initiated emergency (EIE).

### 5.0 Locomotive Inward and Outward Facing Camera Reviews

On March 4, 2024, a head end video preview was conducted by the NTSB IIC for all party members associated with the investigation. The outward video of all three locomotives were previewed. The group noted that the outward video times displayed did not reflect the actual event times. Trains 268H and train 24X differed by approximately 15 to 35 minutes from actual time, while train 19G was displayed in GMT format and differed by five hours with an unknown additional minute offset.

## **6.0 Radio recordings.**

The operations working group reviewed the radio audio recordings from the Harrisburg east dispatching center. A one-hour timeframe was reviewed with the starting time beginning at 06:37 and ending at 07:42 on March 2<sup>nd</sup>, 2024.

Below is a list of notable key events:

- 25A is calling multiple signals stating all aspects w/in NS Operating Rule 242 to include Train ID, signal name, location, & track designation.
- 24X reports clear signal at CP 87, 24X and approach at MP 85.
- 8:57 am train 24X called the signal at 88.6.
- 18N will follow 268 and 24X
- "268 approach Bethlehem" - no direction or track designation
- "268 approach 87" - no direction or track designation
- No signal called for intermediate at from 268
- No stop signal called from 24X
- Train 24X contacted dispatcher and reported collision.
- Train 24X reported that the westbound 19G "was stopped"
- Train 268 reported that they "bumped into the back" of Train 24X.
- Train 268 acknowledged to dispatch that they had been in emergency.
- Train 268 stated that they had "recovered their air".
- Harrisburg east contacts train 19G.
- Train 19G reports collision with an intermodal car and that the head end is "in the river"
- Train 19G reports the derailment.

## **7.0 NS Operating rules in effect at the time of the accident.**

Operating Rules that were in effect at the time of the accident and include the following:

- NS Operating Rules, effective April 15, 2023.
- NS-1 Rules for equipment operation and handling, effective April 15, 2023.
- Keystone Division Timetable No.1 with special instructions.
- Allentown Road subdivision effective 1 November 2023, with revisions effective 27 November 2023.
- Norfolk Southern Safety and General Conduct Rules, effective April 15, 2023.

## 7.1 NS Rule 346 Restricting Signal Indication

336		
336	RESTRICTING	<p>Proceed at Restricted Speed.</p> <p>Restricted Speed must be observed until the leading end of the movement reaches the next signal. <b>EXCEPTION:</b> When the signal governs movement to non-signaled territory or to a track signaled for movement in the opposite direction only, Restricted Speed applies until the leading end of the movement is through any crossovers, turnouts, or controlled point/interlocking limits governed by that signal.</p>

## 7.2 NS Operating Rule Book Definition of Restricted Speed

Restricted Speed – A speed that will permit stopping within half the range vision, short of train, engine, obstruction, railroad car, men or equipment fouling track, any signal requiring a stop, or any derail or switch lined improperly and looking out for a broken rail, but not exceeding:

- 20 MPH, or
- 15 MPH when diverting through any turnout or crossover governed by Conrail Signal indications

### **7.3 NS Rule 240 Responsibilities; Movement of Trains and Engines on Signal Indication**

- (a) Crewmembers must comply with the indication of each signal that affects the movement.

### **7.4 NS Rule 242 Conductor Communicating Signals**

The Conductor (or a Conductor trainee or trainman in the absence of the Conductor), when occupying the controlling locomotive, will communicate by radio as soon as the signal becomes visible:

- (a) Train identification.
- (b) Signal name.
- (c) Location.
- (d) Track designation when operating in multiple track territory for each signal affecting the movement.

When there is no Conductor, Conductor trainee, or trainman, the Engineer or Engineer trainee will communicate the signal information.

### **7.5 NS Rule 99 Precautions Against Unusual Conditions**

Trains must be fully protected against any known condition that may interfere with safe passage.

- (a) If an event occurs or conditions are found that may interfere with the safe passage of trains and no protection has been provided, employees must immediately attempt to stop trains by radio communication.

### **7.6 NS Rule 49 Emergencies by Radio**

An initial emergency transmission will be preceded by the word "emergency" repeated 3 times. An emergency transmission will have priority over all other transmissions and the frequency or channel will be kept clear of non-emergency traffic for the duration of the emergency communication.

## **8.0 Positive Train Control Operations**

Inspection of the lead locomotive showed that the PTC system was working as intended and all on-board PTC hardware had physical seals applied and secured. Investigators could not verify the seal numbers against to the train paperwork, as NS officials had secured the onboard paperwork prior to investigators arriving on scene to the accident site.

## 9.0 Crew Operational Information

### 9.1 Interviews Conducted on Scene

The investigative team conducted four interviews relating to this accident on Monday, March 4, 2024, and two interviews on March 5<sup>th</sup>, 2024. These interviews were held at an NTSB contracted conference room located in Bethlehem, Pennsylvania<sup>2</sup>. These interviews were conducted in the following order:

- Train 268H Conductor (rear-ending train).
- Train 268H Engineer (rear-ending train).
- Train 24X Conductor (stationary train).
- Train 24X Engineer (stationary train).
- Train 19G Conductor (secondary collision train).
- Train 19G Engineer (secondary train train). Internal oversight.

### 9.2 Certification

Train ID	Accident Train	Craft	Hire Date	Certification
24XH101	Stationary (Struck)	Engineer	6/20/1984	8/2/2023
24XH101	Stationary (Struck)	Conductor	5/30/2022	7/1/2024
268H429	Rear-Ending	Engineer	7/9/2007	3/3/2024
268H429	Rear-Ending	Conductor	9/21/2020	3/3/2024
19GH501	Secondary Collision	Engineer	11/6/2008	3/1/2023
19GH501	Secondary Collision	Conductor	7/16/2018	11/1/2021
19GH501	Secondary Collision	Conductor (Trainee)	N/A	7/31/2023

### 9.3 Hours of Service (HOS)

Train ID	Accident Train	Craft	Total Hours on Duty to Incident Time	Prior Off-Duty Hours	Previous Shift Hours Worked
24XH101	Stationary (Struck)	Engineer	6:11	13:53	10:22

<sup>2</sup> The complete interview transcripts are located in the docket at the following web address: <https://data.ntsb.gov/Docket/?NTSBNumber=RRD24FR009>

24XH101	Stationary (Struck)	Conductor	6:11	13:55	10:20
268H429	Rear-Ending	Engineer	4:56	12:02	9:13
268H429	Rear-Ending	Conductor	4:56	12:02	9:13
19GH501	Secondary Collision	Engineer	10:11	17:54	12:00
19GH501	Secondary Collision	Conductor	10:11	17:54	12:00
19GH501	Secondary Collision	Conductor (Trainee)	10:11	17:54	12:00

#### 9.4 Operational Testing History

Train ID	Accident Train	Craft	From Date	End Date	Total Tests	Non-Compliant	NC%
24XH101	Stationary (Struck)	Engineer	3/2/23	3/2/24	225	1	0.44%
24XH101	Stationary (Struck)	Conductor	3/2/23	3/2/24	262	5	1.91%
268H429	Rear-Ending	Engineer	3/2/23	3/2/24	267	0	0.00%
268H429	Rear-Ending	Conductor	3/2/23	3/2/24	161	1	0.62%
19GH501	Secondary Collision	Engineer	3/2/23	3/2/24	289	0	0.00%
19GH501	Secondary Collision	Conductor	3/2/23	3/2/24	240	0	0.00%
19GH501	Secondary Collision	Conductor (Trainee)	3/2/23	3/2/24	69	0	0.00%

#### 9.5 Operating Rules Exam History

Train ID	Accident Train	Craft	Exam Date	Exam Score
24XH101	Stationary (Struck)	Engineer	6/20/2023	94%
24XH101	Stationary (Struck)	Conductor	11/23/2023	82%
268H429	Rear-Ending	Engineer	1/18/2023	86%
268H429	Rear-Ending	Conductor	5/8/2023	90%
19GH501	Secondary Collision	Engineer	2/2/2024	82%
19GH501	Secondary Collision	Conductor	1/17/2024	92%
19GH501	Secondary Collision	Conductor (Trainee)	N/A	N/A

## 9.6 Signal Exam History

Train ID	Accident Train	Craft	Exam Date	Exam Score
24XH101	Stationary (Struck)	Engineer	6/21/2023	98%
24XH101	Stationary (Struck)	Conductor	11/16/2023	98%
268H429	Rear-Ending	Engineer	1/18/2023	95%
268H429	Rear-Ending	Conductor	5/8/2023	93%
19GH501	Secondary Collision	Engineer	2/20/2024	95%
19GH501	Secondary Collision	Conductor	1/17/2023	98%
19GH501	Secondary Collision	Conductor (Trainee)	8/16/2023	95%

## 9.7 Physical Characteristics Exam History

Train ID	Accident Train	Craft	Qualification Segment	Exam Date	Exam Score
24XH101	Stationary (Struck)	Engineer	Keystone - Allentown to North Jersey Terminal	N/A	N/A
24XH101	Stationary (Struck)	Conductor	Keystone - Allentown to North Jersey Terminal	N/A	N/A
268H429	Rear-Ending	Engineer	Keystone - Allentown to North Jersey Terminal	1/18/2023	100%
268H429	Rear-Ending	Conductor	Keystone - Allentown to North Jersey Terminal	5/8/2023	90%
19GH501	Secondary Collision	Engineer	Keystone - Allentown to North Jersey Terminal	N/A	N/A
19GH501	Secondary Collision	Conductor	Keystone - Allentown to North Jersey Terminal	1/17/2023	100%
19GH501	Secondary Collision	Conductor (Trainee)	Keystone - Allentown to North Jersey Terminal	N/A	N/A

## 9.8 Internal oversight.

### 9.8.1 Norfolk Southern operational testing.

As required by federal regulation 49 CFR part 217, NS supervisors conduct operational testing to evaluate compliance with the current NS Operating rules, related Timetable Special Instructions, and federal regulations.

The Program of operational testing within Norfolk Southern is referred to as "RP-1". This program provides supervisor guidelines and establishes the minimum requirements for the quality and type of rule checks to be conducted when monitoring compliance with:

NS Operating Rules  
NS Safety and General Conduct Rules  
NS-1 - Equipment Operation and Handling Rules  
HM-1 - Hazardous Materials Rules  
System Timetable Instructions  
HV-1 - Highway Vehicle Operators Guide  
MSBs - Mechanical Safety Bulletins

Regional Managers of Safety and Operating Practices, Assistant Division Superintendents, Chief Engineers, Director Mechanical Operations (DMO) are responsible for oversight and administration of the Program on their respective division, region, work group, or shop.

The Senior Manager Operating Rules is responsible for the oversight and administration of the Program for the system.

### **9.8.2 Serious Incident Notice- Rear-End Collisions - Keystone Division.**

On March 3<sup>rd</sup>, 2023, Norfolk Southern issued a serious incident notice to their employees for the purpose of elevating awareness with the rules associated with restricted speed. This notice included rule excerpts that were applicable to train operations at restricted speed in signaled territory.

## **10.0 External Oversight**

### **10.1 The Federal Railroad Administration.**

The Federal Railroad Administration (FRA) is the primary agency responsible for the creation and enforcement of federal railroad safety regulations. The FRA exercises these responsibilities for regulating railroad safety standards through the issuance, implementation, and enforcement of railroad safety regulations.

Rail safety regulations that govern FRA inspection and enforcement activities are documented under Title 49, Subtitle B, Chapter II of the Code of Federal Regulations (CFR)<sup>3</sup>.

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<sup>3</sup> An electronic version of Title 49, Subtitle B, Chapter II of the CFR can be found at the following web address: <https://www.ecfr.gov/current/title-49/subtitle-B/chapter-II>



### **10.1.1 FRA post-accident testing.**

FRA post-accident drug and alcohol tests were administered to the engineer and conductor of the striking train (Train 268). The results of this test were negative for both crew members. The four other Norfolk Southern employees involved in this accident were also tested with all tests reporting as negative for drugs or alcohol.

### **10.1.2 Safety Advisory 2012-02; Restricted Speed**

On April 25, 2012, the FRA issued a safety advisory<sup>4</sup> to emphasize the importance of compliance with railroad operating rules when trains and locomotives are operated at restricted speed. This advisory was issued in response to several rear end train collision accidents where failure to operate at restricted speed resulted in significant damage and fatalities.

The investigations related to these accidents indicated that the crewmembers involved were properly trained, experienced, and were qualified on the territory over which they operated. However, in every case, it appeared that there was a lack of attentiveness to the signal indications being conveyed prior to the collisions.

The FRA discussed these concerns and made the following recommendations to the railroads:

1. Discuss the rear-end collisions with operating employees.
2. Conduct restricted Speed Training focusing on the ability to stop within half the range of vision, especially in areas with limited visibility.
3. Conduct quarterly and semi-annual reviews of operational testing data and event recorder data.
4. Reinforce the importance of communication between crewmembers during critical safety periods, such as when copying directives, approaching signals, or during radio communications.
5. Review and reinforce the regulations regarding the use of electronic devices, emphasizing that improper use during safety-critical periods can lead to a loss of situational awareness and increased danger.

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<sup>4</sup> <https://railroads.dot.gov/regulations/federal-register-documents/2012-9948>

### **10.1.3 FRA Supplemental Safety Assessment of Norfolk Southern**

The Federal Railroad Administration (FRA) conducted a safety culture assessment of Norfolk Southern between March 15 and May 15, 2023. This Assessment included a review of operational elements and an evaluation of Norfolk's Southern's overall safety culture. Relevant findings to this accident are listed in Chapter 2: Critical operational elements<sup>5</sup>.

## **10.2 Federal regulations relating to the accident**

### **10.2.1 Part 217–Railroad operating rules.**

Through the requirements of this part, the Federal Railroad Administration learns the condition of operating rules and practices with respect to trains and other rolling equipment in the railroad industry, and each railroad is required to instruct its employees in operating practices.

### **10.2.2 Part 218- Railroad operating practices.**

This part prescribes minimum requirements for railroad operating rules and practices. Each railroad may prescribe additional or more stringent requirements in its operating rules, timetables, timetable special instructions, and other special instructions.

### **10.2.3 Part 220- Railroad communications.**

This part prescribes minimum requirements governing the use of wireless communications in connection with railroad operations. In addition, this part sets forth prohibitions, restrictions, and requirements that apply to the use of personal and railroad-supplied cellular telephones and other electronic devices. So long as these minimum requirements are met, railroads may adopt additional or more stringent requirements.

### **10.2.4 Part 243- Training, qualification, and oversight for safety-related railroad employees.**

The purpose of this part is to ensure that any person employed by a railroad or a contractor of a railroad as a safety-related railroad employee is trained and

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<sup>5</sup> The complete FRA Norfolk Southern safety assessment is located at the following web address: <https://railroads.dot.gov/elibrary/norfolk-southern-safety-assessment>

qualified to comply with any relevant Federal railroad safety laws, regulations, and orders, as well as any relevant railroad rules and procedures promulgated to implement those Federal railroad safety laws, regulations, and orders.

This part contains the general minimum training and qualification requirements for each category and subcategory of safety-related railroad employee, regardless of whether the employee is employed by a railroad or a contractor of a railroad. Contractors shall coordinate with railroads and comply with the contents of this part, including those aspects of training that are specific to the contracting railroad's rules and procedures.

#### **10.2.5 Part 271- Risk reduction program.**

The purpose of this part is to improve railroad safety through structured, proactive processes and procedures developed and implemented by railroads.

Each railroad subject to this part must establish a Risk Reduction Program (RRP) that systematically evaluates railroad safety hazards on its system and manages the risks associated with those hazards to reduce the number and rates of railroad accidents/incidents, injuries, and fatalities.

#### **11.0 NTSB special report RIR-23-12 "Beyond positive train control.**

On November 1<sup>st</sup>, 2023, the National Transportation Safety Board (NTSB) released a special report titled "Beyond Positive Train Control," which emphasized the need for integrating new and emerging technologies to enhance rail safety.

The NTSB noted in this report that while PTC was successful at signal enforcement, limitations in PTC systems' access to train location information impeded the detection of and response to train-to-train collision threats during restricted speed operations.

The NTSB found that additional research into this area could support the development and implementation of PTC technologies that, by reliably identifying and locating the end of a train and communicating that information to other trains, could prevent train-to-train collisions during restricted speed operations.

As a result of this investigation, the NTSB recommended that the FRA complete and publish research on PTC technologies to prevent train-to-train collisions during restricted speed operations and develop a plan to implement the

research results. The NTSB also recommended that the FRA work with railroads to eliminate exceptions to PTC installation for terminals.