



# Recommendation Report

2/3/2025 10:29:32 AM

**Accident Number:** RRD23MR005

|                            |                    |                       |            |                          |          |
|----------------------------|--------------------|-----------------------|------------|--------------------------|----------|
| <b>Product/Notation Id</b> | 72568 /            | <b>Accident Date:</b> | 02/03/23   | <b>Issue Date:</b>       | 07/12/24 |
| <b>City/State:</b>         | East Palestine, OH | <b>Accident #:</b>    | RRD23MR005 | <b>Most Wanted List:</b> | No       |

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

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| <b>Recommendation # :</b>                                                                                                                                                                                                                                       | I-24-001 | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Require that placards be able to survive fires and accidents and remain legible during such emergencies long enough to fulfill their functions as described in the Emergency Response Guidebook. |          |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                         | 1        |                                  | <b>Overall Date Closed:</b>      | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                               | PHMSA    | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |

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| <b>07/12/24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | NTSB | Transmittal Letter | 73264 |
| The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.nts.gov">http://www.nts.gov</a> .                                                                                                                                                                                                                                                                                                                                                                                     |      |                    |       |
| The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, I-24-001, R-24-012 through R-24-015). We encourage you to submit your response to <a href="mailto:ExecutiveSecretariat@nts.gov">ExecutiveSecretariat@nts.gov</a> . If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response. |      |                    |       |
| This letter provides information about the National Transportation Safety Board's (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.nts.gov">http://www.nts.gov</a> .                                                                                                                                                                                                                                                                                                                                             |      |                    |       |



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As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Pipeline and Hazardous Materials Safety Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Require that placards be able to survive fires and accidents and remain legible during such emergencies long enough to fulfill their functions as described in the Emergency Response Guidebook. (I 24 1) (See section 2.3.3.)
- Obtain the necessary legislative authority and accelerate the deadline for removing specification DOT 111 tank cars from flammable liquids service. (R-24-12) (See section 2.4.2.)
- Establish a tank car replacement schedule whereby non-pressure tank cars in any hazardous materials service must meet or exceed the safety standards of the DOT-117 specification; if necessary, obtain legislative authority to act on this recommendation. (R-24-13) (See section 2.4.2.)
- Revise the definition of high hazard flammable train to account for differences in survivability between tank car specifications and to include hazardous materials other than flammable liquids, such as combustible liquids and Division 2.1 flammable gases, that can contribute to cascading hazardous materials releases; if necessary, obtain legislative authority to act on this recommendation. (R-24-14.) (See section 2.4.4.)
- Distribute the Federal Railroad Administration's most current guidance on the vent and burn method to emergency response agencies by referencing it in the next edition of the Emergency Response Guidebook (R-24-15) (See section 2.5.4.)

In the same report, we also classified the following safety recommendation:

- With the assistance of the Federal Railroad Administration, require that railroads immediately provide to emergency responders accurate, real time information regarding the identity and location of all hazardous materials on a train. (R 07 4)
- Safety Recommendation R-07-4 is classified Closed—Acceptable Action in section 2.3.2 of this report.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendation I-24-1, Safety Recommendations R-24-12 through -15, and classified Safety Recommendation R 07 4). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3,



2023" published on July 12, 2024:

2.3.3 Placard Legibility

When a shipping name or identification number cannot be associated with a tank car or other package during an emergency response, the 2024 ERG (like the 2020 ERG current at the time of the East Palestine derailment) recommends reading the placards from a safe distance to determine what protective measures are appropriate (PHMSA 2024). Under 49 CFR 172.519, placards must be capable of withstanding 30 days of exposure to open weather conditions without deterioration or a substantial reduction in effectiveness. The performance standard does not address derailments or fires—circumstances under which emergency responders may need to use placards as instructed by the 2024 ERG.

The derailment of train 32N produced a derailment footprint about 1,200 feet long and comprising a mixture of hazardous and non-hazardous materials tank cars. Even with access to consist information, distinguishing which tank cars contained hazardous materials depended on the legibility of tank car markings, placarding, or accurate assessment of a tank car's original line number. Because the derailment displaced tank cars from their original order and damaged or obscured markings, placards were the best option for responders to identify hazardous materials and appropriate protective measures. However, as the deputy fire chief reported in interviews with the NTSB, responding firefighters found that placards had been destroyed by fire and could not aid efforts to identify hazardous materials present at the scene. Firefighters continued to operate close to the derailment pileup and fires until NS personnel and contractors advised them to withdraw to a safer distance. Therefore, the NTSB concludes that the vulnerability of tank car placards to fire exposure resulted in illegible placards and hampered emergency responders' efforts to identify hazards. Current federal requirements for placards address normal transportation conditions but do not account for placard survivability during derailments or fire exposure. The requirements for survivability therefore do not adequately account for events where placards may be the sole immediate source of hazard information and will be subjected to fire or other sources of damage. The 2024 ERG notes that this scenario is possible, and it occurred at East Palestine. Placarding requirements should include survivability sufficient to ensure that placards are usable by emergency responders during rail and other transportation emergencies. The NTSB is aware of placard designs, such as placards cut from steel, likely to offer improved survivability under accident conditions compared to tagboard or plastic. The NTSB recommends that PHMSA require that placards be able to survive fires and accidents and remain legible during such emergencies long enough to fulfill their functions as described in the ERG.

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| 10/11/24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Addressee | Official Correspondence | 73823 |
| -From Tristan H. Brown, Deputy Administrator: PHMSA concurs with the NTSB's concern that placards and other hazard communication on transport packaging and vehicles may not currently be able to withstand fires or other conditions expected during accidents. PHMSA has initiated a Small Business Innovation Research project to investigate the use of a novel material and laser engraved metal sheet to improve placard and other hazard communication survivability. Additionally, PHMSA will research the operational benefits of deploying improved placards and work with industry to maintain awareness of existing opportunities to address this recommendation. |           |                         |       |



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

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| <b>Recommendation # :</b> | R-24-001 | <b>Overall Status:</b> | Open - Await Response | CLASS II |
|---------------------------|----------|------------------------|-----------------------|----------|

TO THE UNITED STATES DEPARTMENT OF TRANSPORTATION: Require the Federal Railroad Administration to issue regulations for inward-facing recorders that include image and audio recordings as recommended by the National Transportation Safety Board in R-24-10 and R-24-11. If necessary, obtain legislative authority to act on this recommendation. (Superseded Safety Recommendation R-19-7)

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|-------------------------|---|-----------------------------|-----|
| <b># of Addressees:</b> | 1 | <b>Overall Date Closed:</b> | N/A |
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| <b>Addressee:</b> | DOT | Open - Await Response | <b>Date Closed:</b> | N/A |
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|-----------------|------|--------------------|-------|
| <b>07/12/24</b> | NTSB | Transmittal Letter | 73264 |
|-----------------|------|--------------------|-------|

The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsbt.gov>.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, R-24-001). We encourage you to submit your response to [ExecutiveSecretariat@ntsbt.gov](mailto:ExecutiveSecretariat@ntsbt.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;



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- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendation to the Secretary of Transportation. Additional information regarding this recommendation can be found in the noted section of the report.

- Require the Federal Railroad Administration to issue regulations for inward-facing recorders that include image and audio recordings as recommended by the National Transportation Safety Board in R 24 10 and R-24-11. If necessary, obtain legislative authority to act on this recommendation. (R-24-1) (See section 2.6.)

In the same report, we also classified the following safety recommendation:

- Require the Federal Railroad Administration to issue regulations for inward facing recorders that include image and audio recordings as recommended by the National Transportation Safety Board in R 10 1 and R 10 2. (R 19 7)

Safety Recommendation R-19-7 is classified Closed—Superseded in section 2.6 of this report. This recommendation is superseded by Safety Recommendation R 24 1.

The NTSB is vitally interested in this recommendation because it is designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement this recommendation. When replying, please refer to the safety recommendation by number (Safety Recommendation R-24-1 and classified Safety Recommendation R-19-7). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 “Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023” published on July 12, 2024:

**2.6 Locomotive Data Recorders** The lead locomotive of train 32N was equipped with both head-end and inward-facing image recorders that provided investigators with video and audio data detailing the crew’s activities and actions in the moments leading up to and during the derailment. NS voluntarily installed these devices; image and audio recorders are not required by FRA regulations for freight locomotives. In this accident, the audio and video data demonstrated and confirmed that the crewmembers were alert and responded appropriately to the hot bearing alarm. Additionally, the data were instrumental in corroborating crew statements.

The NTSB has determined that many previous railroad accident investigations would have benefitted from this technology. In a number of these accidents, the operator was killed, seriously injured, or could not recall details moments before the accident. However, even in the cases where the operator was not injured, audio and image recorders could be used to help verify what might have been seen and what crew actions were taken during the accident sequence.

For example, audio and image recorders were beneficial to our investigation of the Amtrak passenger train 501 derailment in DuPont, Washington, on December 18, 2017 (NTSB 2019). In that accident, the locomotive was equipped with an inward-facing image recorder that provided both a visual and audio recording of the crewmember activities during the accident trip. The device was voluntarily installed, and the recorded information proved extremely useful in the NTSB investigation.

Further, image recordings were also beneficial to our investigations of the January 4, 2017, collision of two Southeastern Pennsylvania Transportation Authority trolleys in Philadelphia, Pennsylvania, and the April 3, 2016, Amtrak accident in Chester,



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Pennsylvania (NTSB 2018b, NTSB 2017c). In those accidents, as in East Palestine, investigators used the image recordings to gather additional pertinent information about the accident sequence and used the audio recordings to corroborate the statements made by the operating crews. In turn, this information was used to develop recommendations to improve the safety of train operations. These types of recorders are also critical to improving operational safety and management oversight.

Unfortunately, in many other railroad accidents, the NTSB has not been able to determine the actions of the crewmembers operating the train because of the lack of inward-facing image and audio recordings. In our investigation of the August 12, 2019, collision of two CSX Transportation freight trains near Carey, Ohio, the NTSB was unable to determine the actions of the westbound train's crewmembers when they were operating the train from Columbus, Ohio, to Carey, Ohio; the actions of the westbound train engineer operating alone in the locomotive cab; or the events leading up to the collision (NTSB 2020c). This collision again demonstrated the need for in-cab recording devices to better understand and thereby prevent serious railroad collisions.

Similar issues were found during the NTSB's investigation of the September 12, 2008, head-on collision in Chatsworth, California, between a Metrolink passenger train and a Union Pacific Railroad freight train (NTSB 2010). The NTSB was unable to determine the actions of the Metrolink engineer leading up to the collision, and after discovering some illicit activities by the train engineer during previous trips, the NTSB determined that Metrolink had no way of monitoring the train engineer's activities to ensure appropriate behavior.

The Chatsworth collision, in which 25 people were killed and 102 people were injured, underscored the importance of understanding the activities of crewmembers in the time leading up to the collision. As a result of that investigation, on February 23, 2010, the NTSB issued Safety Recommendations R-10-1 and R-10-2 to the FRA: Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash- and fire-protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. (R-10-1)159 Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R-10-2)160

In the 14 years since these recommendations were issued, the NTSB has reiterated them in the following seven major railroad accident investigations:

- September 30, 2010, collision of two Canadian National Railway freight trains near Two Harbors, Minnesota (NTSB 2013c)
- April 17, 2011, collision of a BNSF coal train with the rear end of a standing BNSF maintenance-of-way train in Red Oak, Iowa (NTSB 2012a)
- June 24, 2012, head-on collision of two Union Pacific Railroad freight trains near Goodwell, Oklahoma (NTSB 2013b)
- May 25, 2013, collision of a Union Pacific Railroad freight train with a BNSF Railway freight train near Chaffee, Missouri (NTSB 2014a)
- April 28, 2015, collision of two Southwestern Railroad freight trains near Roswell, New Mexico (NTSB 2018c)
- May 12, 2015, derailment of a National Railroad Passenger Corporation (Amtrak) passenger train in Philadelphia, Pennsylvania (NTSB 2016a)
- August 12, 2019, collision of two CSX Transportation freight trains near Carey, Ohio (NTSB 2020c)

Following the investigation of one of these accidents, the June 24, 2012, collision in Goodwell, Oklahoma, the NTSB made the following safety recommendation to all Class I railroads: Install in all controlling locomotive cabs and cab car operating compartments crash- and fire-protected inward- and outward-facing audio and image recorders. The devices should have a minimum 12-hour continuous recording capability. (R-13-26)

In response to Safety Recommendation R-13-26, on December 10, 2014, NS informed us that it already used outward-facing image



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recorders, and that it was analyzing safety benefits, costs, and employee privacy concerns related to inward-facing image recorders. On May 4, 2015, we noted these efforts and encouraged NS to install the recommended inward-facing audio and image recorders. Pending completion of that action, Safety Recommendation R-13-26 was classified Open—Acceptable Response. On December 23, 2021, we followed up with NS on the status of implementation of the recommendation, but we have not yet received a reply. The lead locomotive involved in the East Palestine derailment was equipped with inward- and outward-facing image and audio recorders.

We issued R-13-26 to a total of seven Class I railroads. Of the remaining six Class I railroads, three have a status of Open—Acceptable Response, two have a status of Open—Unacceptable Response, and one has a status of Open—Await Response because the railroad has not yet responded. We are concerned that in over 10 years since we issued R-13-26, none of the Class I railroads has fully implemented this recommendation.

In response to Safety Recommendations R-10-1 and R-10-2, the FRA announced at a May 28, 2015, meeting of the Railroad Safety Advisory Committee that in the absence of Railroad Safety Advisory Committee consensus recommendations, the FRA was proceeding with an NPRM addressing mandatory installation of locomotive recording devices in both freight and passenger railroads. As a result, on September 29, 2015, Safety Recommendations R-10-1 and R-10-2 were classified Open—Acceptable Response.

The 2015 FAST Act required the Secretary of Transportation to promulgate, within 2 years after the date of the FAST Act, regulations to require each railroad carrier that provides regularly scheduled, intercity rail passenger or commuter rail passenger transportation to install inward- and outward-facing image recording devices in all controlling locomotive cabs and cab car operating compartments. However, the FRA did not develop regulations requiring that recording devices be installed in intercity rail passenger or commuter passenger transportation within the 2-year deadline. In our May 2019 DuPont accident report, the NTSB concluded that: The Federal Railroad Administration has demonstrated an unwillingness to implement the recommendations and regulation that would require inward-facing video and audio devices that are critical to accident investigations and improving safety on our nation's railroads. (NTSB 2019)

We further concluded that: Inward-facing recorders with both image and audio capabilities can increase the understanding of the circumstances of an accident, and, ultimately, provide greater precision in safety recommendations and subsequent safety improvements. Consequently, we issued the following recommendation to the Secretary of Transportation on June 21, 2019: Require the Federal Railroad Administration to issue regulations for inward-facing recorders that include image and audio recordings as recommended by the National Transportation Safety Board in R-10-1 and R-10-2. (R-19-7)

We have yet to receive a response from the Secretary of Transportation and the recommendation remains classified Open—Await Response. On July 24, 2019, 9 years after we issued R-10-1 and R-10-2 and more than a year and a half after the FAST Act required regulatory action, the FRA published an NPRM, titled "Locomotive Image and Audio Recording Devices for Passenger Trains," proposing a requirement to install inward- and outward-facing recorders in passenger trains (84 Fed. Reg. 35712). The NPRM was only partially responsive to the NTSB recommendations because it did not apply to freight railroads.

On September 16, 2019, the NTSB stated the following in response to the NPRM: Freight trains and passenger trains operate on the same railroad tracks, posing the risk of accidents that have the potential to significantly affect the public. From a safety management system perspective, it is probable that recorded information about safety problems identified in freight railroad accidents and incidents could inform, mitigate, or prevent similar safety problems that might potentially affect passenger railroad operations. As a result, we believe it would be shortsighted to limit the proposed rule to passenger railroads. The FRA should ensure one level of safety for both passenger and freight railroads. Further, we firmly believe any such devices that railroads have already voluntarily installed, whether on freight or passenger trains, should be required to meet the minimum standards in the final rule. Of the seven reiterations since we issued R-10-1 and R-10-2, six have involved collisions of freight trains.

In our 2020 Carey report, we concluded that "inward- and outward-facing recorders can improve the quality of accident and incident investigations and provide the opportunity for proactive steps by railroad management to verify that train crew actions are in accordance with safety rules and procedures" (NTSB 2020c). As a result, we reiterated Safety Recommendations R-10-1 and R-10-2 to the FRA. Because it had been 10 years since the recommendations were issued and the FRA had begun to address only passenger railroads, and not freight railroads, Safety Recommendations R-10-1 and R-10-2 were classified Open—Unacceptable Response.

On October 12, 2023, the FRA published the final rule, "Locomotive Image and Audio Recording Devices for Passenger Trains," amending 49 CFR Parts 217, 218, 229, and 299. The FRA rule requires installation of inward- and outward-facing locomotive image



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recording devices on all lead locomotives in passenger trains, as required by the FAST Act. The FRA declined to require freight railroads to install recording devices at the time of the rulemaking, saying the statutory requirements at 49 United States Code 20168(a) did not apply to freight locomotives (88 Fed. Reg. 70722). The rule falls short of our recommendations because it fails to require audio recording and excludes freight rail from any requirements. More than 14 years have passed since we recommended that the FRA require audio and image recorders in all locomotives, whether on freight or passenger trains. The recommendations were prompted by railroad accident investigations in which the NTSB determined having inward- and outward-facing audio and image recorders would have provided crucial information to the railroads, their workforces, the FRA, and the NTSB that could have improved safety. In a number of those accidents, the operator died, was seriously injured, or could not recall details from moments before the accident.

Inward- and outward-facing audio and image recorders that are crash- and fire-protected provide valuable information about the events leading up to and during an accident in determining why it occurred. In this case, inward-facing image and audio data were instrumental in eliminating the train crew's performance as a factor in the accident. Further, recorded image and audio information allows railroads, labor unions, the FRA, and the NTSB to identify and immediately address critical improvements that directly impact the safety of the rail industry, the traveling public, and the communities in which our railroads operate. The NTSB concludes that inward- and outward-facing recorders can improve the quality of accident and incident investigations and provide the opportunity for proactive steps by railroad management to verify that train crew actions are in accordance with safety rules and procedures. Therefore, the NTSB reiterates Safety Recommendation R-13-26 to the Class I railroads.

The NTSB believes that the FRA has the regulatory authority to establish regulations to act on Safety Recommendations R-10-1 and R-10-2. The relevant language in the FAST Act mandated that the FRA require image recorders for passenger and commuter trains but did not modify the FRA's existing authority to establish requirements for rail equipment, including image and audio recorders, to improve safety. However, we note that the FRA's rulemaking on image recorders resulted from a specific legislative mandate to act, and we believe that a legislative mandate to act on Safety Recommendations R-10-1 and R-10-2 would result in the FRA satisfying these long-standing recommendations. Therefore, the NTSB recommends that the FRA require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. The NTSB also recommends that the FRA require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. If necessary, obtain legislative authority to act on this recommendation. Safety Recommendations R-10-1 and R-10-2 are classified Closed—Superseded.

Finally, the NTSB concludes that the FRA's final rule in response to the FAST Act did not require audio recording in passenger locomotives and did not require inward- and outward-facing image and audio recording in freight rail locomotives, resulting in a missed opportunity to record important safety data. As noted above, the FAST Act did not directly mandate that the FRA establish regulations that would satisfy Safety Recommendations R-10-1 and R-10-2, and the FRA's October 2023 rulemaking did not address all the safety concerns raised by the NTSB. Therefore, the NTSB recommends that the Secretary of Transportation require the FRA to issue regulations for inward-facing recorders that include image and audio recordings as recommended by the NTSB in R-24-10 and R-24-11. If necessary, obtain legislative authority to act on this recommendation. Safety Recommendation R-19-7 is classified Closed—Superseded.



# Recommendation Report

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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |                                  |                                  |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | R-24-002 | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO THE FEDERAL RAILROAD ADMINISTRATION: Research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1        |                                  | <b>Overall Date Closed:</b>      | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | FRA      | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |
| <b>07/12/24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | NTSB     | Transmittal Letter               | 73264                            |          |
| The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbgov">http://www.ntsbgov</a> .                                                                                                                                                                                                                                                                                                                                                                             |          |                                  |                                  |          |
| The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, R-24-002 through R-24-011). We encourage you to submit your response to <a href="mailto:ExecutiveSecretariat@ntsb.gov">ExecutiveSecretariat@ntsb.gov</a> . If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response. |          |                                  |                                  |          |
| This letter provides information about the National Transportation Safety Board's (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbgov">http://www.ntsbgov</a> .                                                                                                                                                                                                                                                                                                                                     |          |                                  |                                  |          |
| As a result of this investigation, we identified the following safety issues:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |                                  |                                  |          |
| <ul style="list-style-type: none"><li>• Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;</li><li>• Inadequate emergency response training for volunteer first responders;</li><li>• Delayed transmittal of train consist information necessary to protect first responders and the public;</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                    |          |                                  |                                  |          |



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- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Federal Railroad Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. (R-24-2) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors. (R-24-3) (See section 2.2.4.)
- Establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations. (R-24-4) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms. (R-24-5) (See section 2.2.4.)
- Monitor the progress of the Association of American Railroads' (AAR) action on R-24-20 and use your regulatory authority to ensure that the AAR addresses weaknesses in its tank car service equipment approval process. (R-24-6) (See section 2.4.3.1.)
- Distribute the public versions of your 2007 vent and burn reports to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-7) (See section 2.5.4.)
- Update and re publish your 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. (R-24-8) (See section 2.5.4.)
- Make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-9) (See section 2.5.4.)
- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. (R-24-10) (See section 2.6.)
- Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. If necessary, obtain legislative authority to act on this recommendation. (R-24-11) (See section 2.6.)



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In the same report, we also classified the following safety recommendations:

- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward and outward facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12 hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. (R 10 1)

Safety Recommendation R-10-1 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 10.

- Require that railroads regularly review and use in cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R 10 2)

Safety Recommendation R-10-2 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 11.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-2 through -11 and classified Safety Recommendations R-10-1 and -2). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 “Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023” published on July 12, 2024:

## 2.2.4 Bearing Failure Detection

The NTSB reviewed surveillance camera images along train 32N’s route and data from the last three HBDs it traversed before derailling. (See figure 29.) The first of these detectors, located in Sebring, Ohio, and about 30 miles west of the derailment site, did not record any bearing temperatures high enough to trigger an alert or alarm. Surveillance cameras in Sebring, Ohio, captured images of the train, and no anomalies were noted in the images.

The first clear indications of bearing deterioration were captured by surveillance cameras in Salem, Ohio, about 19 miles from the derailment site. Images from these cameras showed a fire on the L1 bearing of the hopper car.

Shortly after the train passed the field of view of these surveillance cameras, it traversed an HBD in Salem, Ohio, which recorded a temperature 103°F above ambient on the L1 bearing of the hopper car. This measurement was below the 170°F threshold that would have triggered an alarm broadcast to the train crew, which remained unaware that a bearing was showing unusual behavior. The measurement met the NS temperature criteria to trigger a non-critical alert at the NS ATC Wayside Help Desk. The non-critical alert identified the L1 bearing as needing continued monitoring: a trend analysis based on data from additional HBDs. Because train 32N derailed before it finished traversing the next HBD (in East Palestine), this trend analysis could not take place. The analyst on duty also did not see the alert from the Salem HBD because he was working to resolve other, higher-priority alerts, but immediately seeing the Salem HBD alert would not have prevented the derailment; the train derailed before the analyst would have been required by NS procedures to take any actions.

The HBD in Salem, Ohio, was configured to take its temperature readings from the inner edge of the bearing cup. This configuration is intended to reduce the likelihood that railcar components will obstruct the HBD’s view of the bearing. However, changes in temperature take time to equalize across different bearing components, meaning that as a bearing begins to overheat, the interior of a bearing may be hotter than the exterior, and two points on the exterior may differ in temperature. The fire visible in surveillance camera images indicates that at least the outer edge of the bearing was hot enough to result in the combustion of grease or another flammable substance. Part of the bearing was therefore hotter than the 103°F temperature the HBD measured at the inner edge of



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the bearing cup. The temperature measurement, which was likely lower than the bearing's actual highest temperature, resulted in a non-critical alert for a bearing that burned off and separated less than 20 miles later. The NTSB concludes that the non-critical alert transmitted by the Salem, Ohio, HBD did not reflect the true temperature and failing condition of the L1 wheel bearing.

It is unclear whether a different HBD design or configuration would have provided a more accurate measurement of the bearing's temperature. The NTSB's review of existing research on HBDs found that variations in railcar design pose significant challenges to measuring temperatures near the center or outer edge of the bearing cup; parts of the railcar's trucks can obstruct the HBDs field of view (Carter and Clasby 2017). Further, measuring a different or larger surface area of the bearing cup does not ensure that the measurement will include the hottest part of the bearing, which may be inside the bearing or outside the HBD's field of view. As discussed during the Investigative Hearing, changes in the exterior temperature of a bearing tend to lag behind changes in the interior temperature.<sup>117</sup> The NTSB concludes that a failing wheel bearing's actual internal temperatures will likely exceed external temperatures measured and reported by an HBD, and this limit on HBD accuracy is inherent in how current HBDs and railcar trucks are designed.

Following the non-critical alert transmitted by the Salem HBD, NS standard operating procedures required the employee staffing the Wayside Help Desk to monitor the L1 bearing as it traversed additional detectors and to determine whether the temperature trend required further action. However, the distance between the HBDs and the speed of bearing degradation were such that, by the time the train reached the next HBD, about 19 miles away in East Palestine, the L1 bearing was already failing. Its exterior temperature measurement had reached at least 253°F, more than 50°F above the critical bearing alarm threshold. The Wayside Help Desk procedures did not create an opportunity to notify the crew of a problem before the East Palestine HBD broadcast a critical alarm. The bearing separated less than a minute later, as the crew began to stop the train. The NTSB concludes that the combination of NS standard operating procedures that required only continued monitoring for non-critical bearing alerts, the limited ability of HBDs to measure a bearing's actual internal temperature, and the distance between detectors did not give the train's crew adequate warning to stop the train before the suspect bearing failed and caused the derailment.

At the NTSB's Investigative Hearing, the NS Assistant Vice President of Signals and Communications testified that NS based its alert and alarm temperature thresholds on its own experience with HBDs and AAR standards.<sup>118</sup> However, as the AAR Senior Vice President of Safety and Operations testified, the AAR definition of an overheated bearing is based on what makes a railcar repair billable to the railcar owner or lessor, and railroads choose their own temperature thresholds and operating procedures based on their experience balancing between preventing bearing failures and avoiding unnecessary stops. <sup>119</sup> It is unclear whether the AAR definition of an overheated bearing is an appropriate temperature threshold for a wayside defect detection system intended to prevent accidents, especially when some current detector technologies—such as the HBDs relevant to the East Palestine derailment—may not accurately measure a bearing's maximum temperature.

To determine whether NS's use of wayside bearing defect detectors was representative of general industry practice, the NTSB requested information from all the Class I railroads about their use of wayside bearing defect detectors. All six Class I railroads responded, and the results are summarized in table 7. All six Class I railroads reported using HBDs and ABDs, but they varied in alarm criteria, wayside equipment inspection and maintenance intervals, detector spacing, and plans for future deployments of HBDs and ABDs. The available information also described HBD deployment in terms of "average" spacing between detectors, which may mask additional variation. Depending on the exact locations of the HBDs, the average spacing may not be the typical spacing, and the maximum distance between HBDs may differ dramatically from the average. In the East Palestine derailment, the three HBDs of interest were an average of about 15 miles apart, but the interval between the Salem HBD and East Palestine HBD was about 19 miles, and the train derailed while traversing the East Palestine HBD. The maximum distance between detectors is therefore a useful metric in evaluating wayside bearing defect detection systems, but the current typical maximum is unclear.

The AAR does have recommended practices for HBD installation on key routes in its Circular OT-55-R, which specifies wayside defect detector spacing of 40 miles or less or "an equivalent level of protection based on improvements in technology" (AAR 2024a). However, the HBDs traversed by train 32N shortly before the derailment met this criterion, and the bearing that led to the derailment went from below the alert threshold to separated in about 30 miles. Further, this maximum applies only to key routes, and the option to install an "equivalent level of protection" invites the question of what level of protection a 40-mile maximum spacing provides compared to alternatives.

The NTSB acknowledges the positive impact of proven technologies such as HBDs and the growing use of newer technologies such as ABDs. However, the variations in wayside detector alarm criteria, configurations, and maintenance indicate that the rail industry has not reached a consensus on the optimal use and upkeep of wayside bearing defect detection systems. An AAR definition of an



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“overheated bearing” exists, but it relates to billing for repairs, not directly to safety or wayside detection. As the East Palestine derailment demonstrates, the successful use of wayside bearing defect detection systems depends on how these systems are implemented, including alert and alarm criteria that provide train crews with an opportunity to respond to overheating bearings before they fail. The performance of the HBD in Sebring, Ohio, also illustrates the importance of understanding each detection technology’s limitations when planning and operating a wayside bearing defect detection system. Research into these subjects would provide a basis for a more informed approach to the use of bearing defect detection systems. The NTSB concludes that without research into how differences in alert and alarm thresholds and varied distances between detectors affect the performance of wayside bearing defect detection systems, railroads and regulators lack the information to determine what changes would produce significant safety improvements.

According to the database maintained by the FRA’s Office of Safety Analysis, 69 of the 896 FRA-reportable rail accidents (7.7%) attributed to mechanical or electrical failures from 2020 through 2023 were caused by overheated wheel bearings, making overheated wheel bearings the single most common mechanical or electrical cause of accidents.<sup>120</sup> The accident count by year is summarized in table 15.

Because overheated wheel bearings are the single most common mechanical cause of accidents, the NTSB is concerned by the lack of industry consensus on a minimum standard for system configurations and related practices, including alert and alarm thresholds and operating rules. Further, the NTSB has identified additional bearing defect detection technologies undergoing testing and development, such as railcar-mounted bearing defect detectors, that may not share limitations specific to HBDs (Tarawneh, Montalvo, and Wilson 2021; Pams et al. 2024). The FRA has experience in fostering railroads’ development and adoption of advanced safety technology, notably PTC, and is positioned to identify ways of improving bearing defect detection. Therefore, the NTSB recommends that the FRA research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. In addition to experience and expertise in working with industry partners, the FRA has the regulatory authority to set and enforce minimum safety requirements, and railroads must meet or exceed the level of safety provided by FRA regulations. The NTSB recommends that the FRA use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors.

However, even appropriate alert and alarm criteria are insufficient to protect safety if no alert is transmitted because of technical issues or if railroads do not respond effectively to alerts and alarms. In the months after the East Palestine derailment, the NTSB investigated two accidents in which a train traversed an HBD that detected an overheating bearing, but the wayside bearing defect detection system did not prevent a derailment from occurring shortly afterward.

The first derailment occurred on May 10, 2023, when NS freight train 14M in New Castle, Pennsylvania, derailed about 45 minutes after starting to traverse an HBD.<sup>121</sup> The HBD recorded a temperature of 253°F on the east-side bearing of the lead axle of the 164th railcar in the consist (line 167, a hopper car), a temperature high enough to trigger a critical alarm and critical alert, both of which require immediately stopping the train under NS operating rules. The NTSB reviewed radio transmission records and confirmed that the HBD transmitted a critical alarm. However, the NTSB’s review of the locomotive data records showed that the alarm was not broadcast over the in-cab speakers, and the crew of train 14M was not warned that a bearing had overheated.<sup>122</sup> The NTSB also reviewed the Wayside Help Desk data logs and found that the desk did not receive an alert about the overheated bearing.

The NTSB’s on-scene examination of the HBD determined that during maintenance, two transducers—critical components of the HBD that enable it to detect passing trains and count axles—had been removed and replaced in the wrong positions. The incorrectly positioned transducers prevented the HBD from communicating information to the Wayside Help Desk in a way the system could interpret and display. Even though the HBD correctly identified an overheated bearing, a pair of communication failures (one related to the improperly replaced transducers, the other of unknown causes) prevented the wayside bearing defect detection system from warning the crew of train 14M of a failed bearing.

The New Castle derailment illustrates the importance of test and inspection procedures adequate to identify compromised detectors. Currently, these practices are unregulated; the FRA has published guidance on wayside detection systems, but it has stopped short of imposing requirements (FRA 2019). However, railroads rely on wayside bearing defect detection systems for safe operation—much like signal systems, which the FRA regulates under 49 CFR Parts 235 and 236. Unlike the regulations for signal systems, there are no specific regulations for wayside bearing defect detectors prescribing intervals or standards for installation, inspection, testing, calibration, or general maintenance. The NTSB concludes that regulatory requirements for the installation, inspection, and maintenance of wayside bearing defect detectors would protect the reliability of these devices and improve the safety of railroad



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operations. Therefore, the NTSB recommends that the FRA establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations.

The NTSB also investigated the July 6, 2023, derailment of an NS coal train near Elliston, Virginia. 123 In this accident, an HBD broadcast a critical alarm for a bearing on the lead axle of a the 71st railcar (line number 74, a gondola car), indicating a measured temperature of at least 170°F above ambient. When interviewed by the NTSB, the crew described how they stopped the train, confirmed a hot bearing using a temperature indicator stick, and communicated this confirmation to the Wayside Help Desk. 124 The Wayside Help Desk analyst directed them to set out the railcar for inspection. A dispatcher authorized the crew to move the train about 13 miles to a siding before setting out the suspect railcar for inspection. The derailment occurred during this movement while the train was traveling about 25 mph.

As a result of this derailment, NS issued an operations bulletin imposing additional speed and distance limits on moving equipment with suspect bearings. These improvements are confined to NS, and as indicated by the NTSB's survey of Class I railroads, operational responses to bearing alerts and alarms significantly vary by railroad. No publicly available research exists to support comparison of these varied responses, evaluate their effectiveness, and drive continuing improvements. The NTSB concludes that because the effectiveness of wayside bearing defect detection systems depends on appropriate operational responses, and because the rail industry has yet to arrive at a consensus standard for these responses, research is necessary to determine what operational responses to bearing alerts and alarms are sufficient to prevent bearing-related accidents. The NTSB also recommends that the FRA use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms.

01/10/25

Addressee

Official Correspondence

74119

-From Amit Bose, Administrator: This letter responds to your July 12, 2024, letter detailing the 10 Safety Recommendations the National Transportation Safety Board (NTSB) made to the Federal Railroad Administration (FRA) in its accident investigation report RRD23MR005, Norfolk Southern Railway Derailment and Hazardous Materials Release; East Palestine, Ohio; February 3, 2023. NTSB sent a copy of that report to FRA on July 12, 2024.

In the "4. Recommendations" section of the report, NTSB issued to FRA Safety Recommendations R-24-02 through R-24-11, with Safety Recommendations R-24-02 through R-24-05 relating to hot bearing detectors (HBDs). Shortly after the East Palestine accident, FRA initiated a series of actions related to HBDs and wayside detectors in general. These actions, although initiated prior to NTSB's issuance of Recommendations R-24-02 through R-24-05, are relevant to those recommendations. Accordingly, FRA has included below a brief background section describing these actions. As FRA and NTSB representatives discussed on July 29, 2024, FRA has begun work to address the NTSB recommendations included in NTSB's July 12, 2024, letter, and a discussion of FRA's response to each recommendation is below.

Background on FRA's Activities Related to HBDs On March 3, 2023, in response to a series of rail accidents suspected of being caused by burnt journal bearings, including the East Palestine accident, FRA published Safety Advisory 2023-01 addressing the use and maintenance of HBDs. Footnote: 88 FR 13494 (Mar. 3, 2024).

<https://railroads.dot.gov/elibrary/safety-advisory-2023-01-evaluation-policies-and-procedures-related-use-and-maintenance-hot> Since publication of that Safety Advisory, FRA has continued to evaluate railroads' use of HBDs. On June 14, 2023, following another accident suspected of resulting from a burnt journal bearing, FRA issued a supplement to Safety Advisory 2023-01 with the additional recommendation that railroads take action to evaluate the resiliency and accuracy of the overall process used to monitor and measure bearing health. Footnote: 88 FR 38933 (June 14, 2023).

<https://www.federalregister.gov/documents/2023/06/14/2023-12724/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

On July 17, 2023, FRA issued a second supplement to Safety Advisory 2023-01 to reiterate and expand upon the recommendations in its previously published Safety Advisories related to HBDs. Footnote: 89 FR 58243 (July 17, 2024).

<https://www.federalregister.gov/documents/2024/07/17/2024-15691/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

The second supplement reiterates FRA's previous recommendations in Safety Advisory 2023-01 and its July 17, 2023, supplement, and expands on the recommendations to incorporate the findings of ongoing FRA evaluations, including the ongoing investigations into recent accidents suspected of being caused by burnt journals and the finalization of the evaluation of data collected in FRA's High-Hazard Flammable Train Route Assessment (HHFT Route Assessment).



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Footnote: FRA conducted the HHFT Route Assessment in response to direction from Secretary of Transportation Pete Buttigieg. The assessment included a focused inspection and evaluation of routes in the national rail network over which the largest volumes of hazardous materials are transported. As part of that assessment, FRA conducted an initial investigation and evaluation of industry practices, processes, and procedures related to wayside detector technology

<https://railroads.dot.gov/elibrary/high-hazard-flammable-train-route-assessment-legacy-tank-car-focused-inspection-program>

Specifically, the second supplement emphasizes:

- The importance of trend analysis and the opportunity to integrate wayside detector data types to evaluate railcar health;
- The need to establish and follow appropriate processes in analyzing and responding to HBD data;
- The need for railroads to ensure that adequate staff are assigned to monitor and respond to wayside detector data; and
- The need for railroads to maximize the use of HBD data, including sharing wayside detector data between railroads, as a train travels from one railroad to another.

FRA is closely monitoring railroads' implementation of the recommendations in this Safety Advisory and its supplements. At the same time, FRA is supporting the activities of the Railroad Safety Advisory Committee (RSAC), which is tasked with considering and reviewing issues related to wayside detectors, and HBDs in particular. The current RSAC task and the intended output are described below in FRA's response to Safety Recommendation R-24-02.

On April 21, 2023, RSAC approved a task statement forming a working group focused on wayside detectors, with an initial focus on HBDs.<sup>5</sup> This group, the Wayside Detector Working Group, is researching and evaluating the current best practices and standards used by the industry and expects to capture the results in a best practices document, which would be presented at a future RSAC public meeting and published on FRA's website. As discussed in more detail below, this investigation into current best practices will be the starting point for FRA's actions responsive to Safety Recommendations R-24-03 through R-24-05.

Specifically, a best practice document is intended to capture the results of the research and evaluation relating to the installation, maintenance, and calibration of HBDs; the methods and operational responses to an HBD alert or trend data; the necessary processes and procedures associated with sharing real time alert or trend data relating to hot bearings across the railroad network; and the placement of HBDs. Following this initial deliverable, the Working Group will work to prepare a recommendation regarding the need to update existing regulations or develop new regulations and guidance regarding HBD installation, maintenance, and calibration procedures; the thresholds for alerts and trends; methods for monitoring and operational responses to alerts and alarms; the sharing of HBD health data between railroads; and determining the placement of HBDs. These efforts support the intent of Safety Recommendation R-24-02, and accordingly, we request that NTSB classify this recommendation as, "Open—Acceptable Response."



# Recommendation Report

2/3/2025 10:29:32 AM

**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquefied flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

**Recommendation # :** R-24-003 **Overall Status:** Open - Initial Response Received CLASS II

TO THE FEDERAL RAILROAD ADMINISTRATION: Use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors.

**# of Addressees:** 1 **Overall Date Closed:** N/A

**Addressee:** FRA **Open - Initial Response Received** **Date Closed:** N/A

**07/12/24** NTSB Transmittal Letter 73264

The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.nts.gov>.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, R-24-002 through R-24-011). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

This letter provides information about the National Transportation Safety Board's (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.nts.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;



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- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Federal Railroad Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. (R-24-2) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors. (R-24-3) (See section 2.2.4.)
- Establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations. (R-24-4) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms. (R-24-5) (See section 2.2.4.)
- Monitor the progress of the Association of American Railroads' (AAR) action on R-24-20 and use your regulatory authority to ensure that the AAR addresses weaknesses in its tank car service equipment approval process. (R-24-6) (See section 2.4.3.1.)
- Distribute the public versions of your 2007 vent and burn reports to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-7) (See section 2.5.4.)
- Update and re publish your 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. (R-24-8) (See section 2.5.4.)
- Make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-9) (See section 2.5.4.)
- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. (R-24-10) (See section 2.6.)
- Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. If necessary, obtain legislative authority to act on this recommendation. (R-24-11) (See section 2.6.)



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In the same report, we also classified the following safety recommendations:

- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward and outward facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12 hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. (R 10 1)

Safety Recommendation R-10-1 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 10.

- Require that railroads regularly review and use in cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R 10 2)

Safety Recommendation R-10-2 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 11.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-2 through -11 and classified Safety Recommendations R-10-1 and -2). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 “Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023” published on July 12, 2024:

## 2.2.4 Bearing Failure Detection

The NTSB reviewed surveillance camera images along train 32N’s route and data from the last three HBDs it traversed before derailling. (See figure 29.) The first of these detectors, located in Sebring, Ohio, and about 30 miles west of the derailment site, did not record any bearing temperatures high enough to trigger an alert or alarm. Surveillance cameras in Sebring, Ohio, captured images of the train, and no anomalies were noted in the images.

The first clear indications of bearing deterioration were captured by surveillance cameras in Salem, Ohio, about 19 miles from the derailment site. Images from these cameras showed a fire on the L1 bearing of the hopper car.

Shortly after the train passed the field of view of these surveillance cameras, it traversed an HBD in Salem, Ohio, which recorded a temperature 103°F above ambient on the L1 bearing of the hopper car. This measurement was below the 170°F threshold that would have triggered an alarm broadcast to the train crew, which remained unaware that a bearing was showing unusual behavior. The measurement met the NS temperature criteria to trigger a non-critical alert at the NS ATC Wayside Help Desk. The non-critical alert identified the L1 bearing as needing continued monitoring: a trend analysis based on data from additional HBDs. Because train 32N derailed before it finished traversing the next HBD (in East Palestine), this trend analysis could not take place. The analyst on duty also did not see the alert from the Salem HBD because he was working to resolve other, higher-priority alerts, but immediately seeing the Salem HBD alert would not have prevented the derailment; the train derailed before the analyst would have been required by NS procedures to take any actions.

The HBD in Salem, Ohio, was configured to take its temperature readings from the inner edge of the bearing cup. This configuration is intended to reduce the likelihood that railcar components will obstruct the HBD’s view of the bearing. However, changes in temperature take time to equalize across different bearing components, meaning that as a bearing begins to overheat, the interior of a bearing may be hotter than the exterior, and two points on the exterior may differ in temperature. The fire visible in surveillance camera images indicates that at least the outer edge of the bearing was hot enough to result in the combustion of grease or another



flammable substance. Part of the bearing was therefore hotter than the 103°F temperature the HBD measured at the inner edge of the bearing cup. The temperature measurement, which was likely lower than the bearing's actual highest temperature, resulted in a non-critical alert for a bearing that burned off and separated less than 20 miles later. The NTSB concludes that the non-critical alert transmitted by the Salem, Ohio, HBD did not reflect the true temperature and failing condition of the L1 wheel bearing.

It is unclear whether a different HBD design or configuration would have provided a more accurate measurement of the bearing's temperature. The NTSB's review of existing research on HBDs found that variations in railcar design pose significant challenges to measuring temperatures near the center or outer edge of the bearing cup; parts of the railcar's trucks can obstruct the HBDs field of view (Carter and Clasby 2017). Further, measuring a different or larger surface area of the bearing cup does not ensure that the measurement will include the hottest part of the bearing, which may be inside the bearing or outside the HBD's field of view. As discussed during the Investigative Hearing, changes in the exterior temperature of a bearing tend to lag behind changes in the interior temperature.<sup>117</sup> The NTSB concludes that a failing wheel bearing's actual internal temperatures will likely exceed external temperatures measured and reported by an HBD, and this limit on HBD accuracy is inherent in how current HBDs and railcar trucks are designed.

Following the non-critical alert transmitted by the Salem HBD, NS standard operating procedures required the employee staffing the Wayside Help Desk to monitor the L1 bearing as it traversed additional detectors and to determine whether the temperature trend required further action. However, the distance between the HBDs and the speed of bearing degradation were such that, by the time the train reached the next HBD, about 19 miles away in East Palestine, the L1 bearing was already failing. Its exterior temperature measurement had reached at least 253°F, more than 50°F above the critical bearing alarm threshold. The Wayside Help Desk procedures did not create an opportunity to notify the crew of a problem before the East Palestine HBD broadcast a critical alarm. The bearing separated less than a minute later, as the crew began to stop the train. The NTSB concludes that the combination of NS standard operating procedures that required only continued monitoring for non-critical bearing alerts, the limited ability of HBDs to measure a bearing's actual internal temperature, and the distance between detectors did not give the train's crew adequate warning to stop the train before the suspect bearing failed and caused the derailment.

At the NTSB's Investigative Hearing, the NS Assistant Vice President of Signals and Communications testified that NS based its alert and alarm temperature thresholds on its own experience with HBDs and AAR standards.<sup>118</sup> However, as the AAR Senior Vice President of Safety and Operations testified, the AAR definition of an overheated bearing is based on what makes a railcar repair billable to the railcar owner or lessor, and railroads choose their own temperature thresholds and operating procedures based on their experience balancing between preventing bearing failures and avoiding unnecessary stops. <sup>119</sup> It is unclear whether the AAR definition of an overheated bearing is an appropriate temperature threshold for a wayside defect detection system intended to prevent accidents, especially when some current detector technologies—such as the HBDs relevant to the East Palestine derailment—may not accurately measure a bearing's maximum temperature.

To determine whether NS's use of wayside bearing defect detectors was representative of general industry practice, the NTSB requested information from all the Class I railroads about their use of wayside bearing defect detectors. All six Class I railroads responded, and the results are summarized in table 7. All six Class I railroads reported using HBDs and ABDs, but they varied in alarm criteria, wayside equipment inspection and maintenance intervals, detector spacing, and plans for future deployments of HBDs and ABDs. The available information also described HBD deployment in terms of "average" spacing between detectors, which may mask additional variation. Depending on the exact locations of the HBDs, the average spacing may not be the typical spacing, and the maximum distance between HBDs may differ dramatically from the average. In the East Palestine derailment, the three HBDs of interest were an average of about 15 miles apart, but the interval between the Salem HBD and East Palestine HBD was about 19 miles, and the train derailed while traversing the East Palestine HBD. The maximum distance between detectors is therefore a useful metric in evaluating wayside bearing defect detection systems, but the current typical maximum is unclear.

The AAR does have recommended practices for HBD installation on key routes in its Circular OT-55-R, which specifies wayside defect detector spacing of 40 miles or less or "an equivalent level of protection based on improvements in technology" (AAR 2024a). However, the HBDs traversed by train 32N shortly before the derailment met this criterion, and the bearing that led to the derailment went from below the alert threshold to separated in about 30 miles. Further, this maximum applies only to key routes, and the option to install an "equivalent level of protection" invites the question of what level of protection a 40-mile maximum spacing provides compared to alternatives.

The NTSB acknowledges the positive impact of proven technologies such as HBDs and the growing use of newer technologies such as ABDs. However, the variations in wayside detector alarm criteria, configurations, and maintenance indicate that the rail industry



has not reached a consensus on the optimal use and upkeep of wayside bearing defect detection systems. An AAR definition of an “overheated bearing” exists, but it relates to billing for repairs, not directly to safety or wayside detection. As the East Palestine derailment demonstrates, the successful use of wayside bearing defect detection systems depends on how these systems are implemented, including alert and alarm criteria that provide train crews with an opportunity to respond to overheating bearings before they fail. The performance of the HBD in Sebring, Ohio, also illustrates the importance of understanding each detection technology’s limitations when planning and operating a wayside bearing defect detection system. Research into these subjects would provide a basis for a more informed approach to the use of bearing defect detection systems. The NTSB concludes that without research into how differences in alert and alarm thresholds and varied distances between detectors affect the performance of wayside bearing defect detection systems, railroads and regulators lack the information to determine what changes would produce significant safety improvements.

According to the database maintained by the FRA’s Office of Safety Analysis, 69 of the 896 FRA-reportable rail accidents (7.7%) attributed to mechanical or electrical failures from 2020 through 2023 were caused by overheated wheel bearings, making overheated wheel bearings the single most common mechanical or electrical cause of accidents.<sup>120</sup> The accident count by year is summarized in table 15.

Because overheated wheel bearings are the single most common mechanical cause of accidents, the NTSB is concerned by the lack of industry consensus on a minimum standard for system configurations and related practices, including alert and alarm thresholds and operating rules. Further, the NTSB has identified additional bearing defect detection technologies undergoing testing and development, such as railcar-mounted bearing defect detectors, that may not share limitations specific to HBDs (Tarawneh, Montalvo, and Wilson 2021; Pams et al. 2024). The FRA has experience in fostering railroads’ development and adoption of advanced safety technology, notably PTC, and is positioned to identify ways of improving bearing defect detection. Therefore, the NTSB recommends that the FRA research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. In addition to experience and expertise in working with industry partners, the FRA has the regulatory authority to set and enforce minimum safety requirements, and railroads must meet or exceed the level of safety provided by FRA regulations. The NTSB recommends that the FRA use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors.

However, even appropriate alert and alarm criteria are insufficient to protect safety if no alert is transmitted because of technical issues or if railroads do not respond effectively to alerts and alarms. In the months after the East Palestine derailment, the NTSB investigated two accidents in which a train traversed an HBD that detected an overheating bearing, but the wayside bearing defect detection system did not prevent a derailment from occurring shortly afterward.

The first derailment occurred on May 10, 2023, when NS freight train 14M in New Castle, Pennsylvania, derailed about 45 minutes after starting to traverse an HBD.<sup>121</sup> The HBD recorded a temperature of 253°F on the east-side bearing of the lead axle of the 164th railcar in the consist (line 167, a hopper car), a temperature high enough to trigger a critical alarm and critical alert, both of which require immediately stopping the train under NS operating rules. The NTSB reviewed radio transmission records and confirmed that the HBD transmitted a critical alarm. However, the NTSB’s review of the locomotive data records showed that the alarm was not broadcast over the in-cab speakers, and the crew of train 14M was not warned that a bearing had overheated.<sup>122</sup> The NTSB also reviewed the Wayside Help Desk data logs and found that the desk did not receive an alert about the overheated bearing.

The NTSB’s on-scene examination of the HBD determined that during maintenance, two transducers—critical components of the HBD that enable it to detect passing trains and count axles—had been removed and replaced in the wrong positions. The incorrectly positioned transducers prevented the HBD from communicating information to the Wayside Help Desk in a way the system could interpret and display. Even though the HBD correctly identified an overheated bearing, a pair of communication failures (one related to the improperly replaced transducers, the other of unknown causes) prevented the wayside bearing defect detection system from warning the crew of train 14M of a failed bearing.

The New Castle derailment illustrates the importance of test and inspection procedures adequate to identify compromised detectors. Currently, these practices are unregulated; the FRA has published guidance on wayside detection systems, but it has stopped short of imposing requirements (FRA 2019). However, railroads rely on wayside bearing defect detection systems for safe operation—much like signal systems, which the FRA regulates under 49 CFR Parts 235 and 236. Unlike the regulations for signal systems, there are no specific regulations for wayside bearing defect detectors prescribing intervals or standards for installation, inspection, testing, calibration, or general maintenance. The NTSB concludes that regulatory requirements for the installation, inspection, and



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maintenance of wayside bearing defect detectors would protect the reliability of these devices and improve the safety of railroad operations. Therefore, the NTSB recommends that the FRA establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations.

The NTSB also investigated the July 6, 2023, derailment of an NS coal train near Elliston, Virginia. 123 In this accident, an HBD broadcast a critical alarm for a bearing on the lead axle of a the 71st railcar (line number 74, a gondola car), indicating a measured temperature of at least 170°F above ambient. When interviewed by the NTSB, the crew described how they stopped the train, confirmed a hot bearing using a temperature indicator stick, and communicated this confirmation to the Wayside Help Desk. 124 The Wayside Help Desk analyst directed them to set out the railcar for inspection. A dispatcher authorized the crew to move the train about 13 miles to a siding before setting out the suspect railcar for inspection. The derailment occurred during this movement while the train was traveling about 25 mph.

As a result of this derailment, NS issued an operations bulletin imposing additional speed and distance limits on moving equipment with suspect bearings. These improvements are confined to NS, and as indicated by the NTSB's survey of Class I railroads, operational responses to bearing alerts and alarms significantly vary by railroad. No publicly available research exists to support comparison of these varied responses, evaluate their effectiveness, and drive continuing improvements. The NTSB concludes that because the effectiveness of wayside bearing defect detection systems depends on appropriate operational responses, and because the rail industry has yet to arrive at a consensus standard for these responses, research is necessary to determine what operational responses to bearing alerts and alarms are sufficient to prevent bearing-related accidents. The NTSB also recommends that the FRA use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms.

**01/10/25**

Addressee

Official Correspondence

74119

-From Amit Bose, Administrator: This letter responds to your July 12, 2024, letter detailing the 10 Safety Recommendations the National Transportation Safety Board (NTSB) made to the Federal Railroad Administration (FRA) in its accident investigation report RRD23MR005, Norfolk Southern Railway Derailment and Hazardous Materials Release; East Palestine, Ohio; February 3, 2023. NTSB sent a copy of that report to FRA on July 12, 2024.

In the "4. Recommendations" section of the report, NTSB issued to FRA Safety Recommendations R-24-02 through R-24-11, with Safety Recommendations R-24-02 through R-24-05 relating to hot bearing detectors (HBDs). Shortly after the East Palestine accident, FRA initiated a series of actions related to HBDs and wayside detectors in general. These actions, although initiated prior to NTSB's issuance of Recommendations R-24-02 through R-24-05, are relevant to those recommendations. Accordingly, FRA has included below a brief background section describing these actions. As FRA and NTSB representatives discussed on July 29, 2024, FRA has begun work to address the NTSB recommendations included in NTSB's July 12, 2024, letter, and a discussion of FRA's response to each recommendation is below.

Background on FRA's Activities Related to HBDs On March 3, 2023, in response to a series of rail accidents suspected of being caused by burnt journal bearings, including the East Palestine accident, FRA published Safety Advisory 2023-01 addressing the use and maintenance of HBDs. Footnote: 88 FR 13494 (Mar. 3, 2024).  
<https://railroads.dot.gov/elibrary/safety-advisory-2023-01-evaluation-policies-and-procedures-related-use-and-maintenance-hot>  
Since publication of that Safety Advisory, FRA has continued to evaluate railroads' use of HBDs. On June 14, 2023, following another accident suspected of resulting from a burnt journal bearing, FRA issued a supplement to Safety Advisory 2023-01 with the additional recommendation that railroads take action to evaluate the resiliency and accuracy of the overall process used to monitor and measure bearing health. Footnote: 88 FR 38933 (June 14, 2023).  
<https://www.federalregister.gov/documents/2023/06/14/2023-12724/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

On July 17, 2023, FRA issued a second supplement to Safety Advisory 2023-01 to reiterate and expand upon the recommendations in its previously published Safety Advisories related to HBDs. Footnote: 89 FR 58243 (July 17, 2024).  
<https://www.federalregister.gov/documents/2024/07/17/2024-15691/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

The second supplement reiterates FRA's previous recommendations in Safety Advisory 2023-01 and its July 17, 2023, supplement, and expands on the recommendations to incorporate the findings of ongoing FRA evaluations, including the ongoing investigations into recent accidents suspected of being caused by burnt journals and the finalization of the evaluation of data collected in FRA's High-Hazard Flammable Train Route Assessment (HHFT Route Assessment).



Footnote: FRA conducted the HHFT Route Assessment in response to direction from Secretary of Transportation Pete Buttigieg. The assessment included a focused inspection and evaluation of routes in the national rail network over which the largest volumes of hazardous materials are transported. As part of that assessment, FRA conducted an initial investigation and evaluation of industry practices, processes, and procedures related to wayside detector technology

<https://railroads.dot.gov/elibrary/high-hazard-flammable-train-route-assessment-legacy-tank-car-focused-inspection-program>

Specifically, the second supplement emphasizes:

- The importance of trend analysis and the opportunity to integrate wayside detector data types to evaluate railcar health;
- The need to establish and follow appropriate processes in analyzing and responding to HBD data;
- The need for railroads to ensure that adequate staff are assigned to monitor and respond to wayside detector data; and
- The need for railroads to maximize the use of HBD data, including sharing wayside detector data between railroads, as a train travels from one railroad to another.

FRA is closely monitoring railroads' implementation of the recommendations in this Safety Advisory and its supplements. At the same time, FRA is supporting the activities of the Railroad Safety Advisory Committee (RSAC), which is tasked with considering and reviewing issues related to wayside detectors, and HBDs in particular. The current RSAC task and the intended output are described below in FRA's response to Safety Recommendation R-24-02.

As mentioned above, the RSAC Wayside Detector Working Group is researching and evaluating current industry best practices and standards. Following completion of this work and after consideration of any resulting recommendations of the Working Group, FRA will use those best practices and recommendations to develop guidelines and/or regulations regarding bearing defect detection systems. Relevant to this recommendation, the Working Group will address alarm and alert thresholds, operational responses to alerts and alarms, and the appropriate placement of bearing defect detection systems. Accordingly, FRA requests that NTSB classify this recommendation as, "Open—Acceptable Response."



# Recommendation Report

2/3/2025 10:29:32 AM

**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

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| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | R-24-004 | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO THE FEDERAL RAILROAD ADMINISTRATION: Establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1        |                                  | <b>Overall Date Closed:</b>      | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | FRA      | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |
| <b>07/12/24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | NTSB     | Transmittal Letter               | 73264                            |          |
| The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbgov">http://www.ntsbgov</a> .                                                                                                                                                                                                                                                                                                                                                                             |          |                                  |                                  |          |
| The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, R-24-002 through R-24-011). We encourage you to submit your response to <a href="mailto:ExecutiveSecretariat@ntsb.gov">ExecutiveSecretariat@ntsb.gov</a> . If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response. |          |                                  |                                  |          |
| This letter provides information about the National Transportation Safety Board's (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbgov">http://www.ntsbgov</a> .                                                                                                                                                                                                                                                                                                                                     |          |                                  |                                  |          |
| As a result of this investigation, we identified the following safety issues:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |                                  |                                  |          |
| <ul style="list-style-type: none"><li>• Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;</li><li>• Inadequate emergency response training for volunteer first responders;</li><li>• Delayed transmittal of train consist information necessary to protect first responders and the public;</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                    |          |                                  |                                  |          |



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- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Federal Railroad Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. (R-24-2) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors. (R-24-3) (See section 2.2.4.)
- Establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations. (R-24-4) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms. (R-24-5) (See section 2.2.4.)
- Monitor the progress of the Association of American Railroads' (AAR) action on R-24-20 and use your regulatory authority to ensure that the AAR addresses weaknesses in its tank car service equipment approval process. (R-24-6) (See section 2.4.3.1.)
- Distribute the public versions of your 2007 vent and burn reports to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-7) (See section 2.5.4.)
- Update and re publish your 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. (R-24-8) (See section 2.5.4.)
- Make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-9) (See section 2.5.4.)
- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. (R-24-10) (See section 2.6.)
- Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. If necessary, obtain legislative authority to act on this recommendation. (R-24-11) (See section 2.6.)



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In the same report, we also classified the following safety recommendations:

- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward and outward facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12 hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. (R 10 1)

Safety Recommendation R-10-1 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 10.

- Require that railroads regularly review and use in cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R 10 2)

Safety Recommendation R-10-2 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 11.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-2 through -11 and classified Safety Recommendations R-10-1 and -2). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 “Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023” published on July 12, 2024:

## 2.2.4 Bearing Failure Detection

The NTSB reviewed surveillance camera images along train 32N’s route and data from the last three HBDs it traversed before derailling. (See figure 29.) The first of these detectors, located in Sebring, Ohio, and about 30 miles west of the derailment site, did not record any bearing temperatures high enough to trigger an alert or alarm. Surveillance cameras in Sebring, Ohio, captured images of the train, and no anomalies were noted in the images.

The first clear indications of bearing deterioration were captured by surveillance cameras in Salem, Ohio, about 19 miles from the derailment site. Images from these cameras showed a fire on the L1 bearing of the hopper car.

Shortly after the train passed the field of view of these surveillance cameras, it traversed an HBD in Salem, Ohio, which recorded a temperature 103°F above ambient on the L1 bearing of the hopper car. This measurement was below the 170°F threshold that would have triggered an alarm broadcast to the train crew, which remained unaware that a bearing was showing unusual behavior. The measurement met the NS temperature criteria to trigger a non-critical alert at the NS ATC Wayside Help Desk. The non-critical alert identified the L1 bearing as needing continued monitoring: a trend analysis based on data from additional HBDs. Because train 32N derailed before it finished traversing the next HBD (in East Palestine), this trend analysis could not take place. The analyst on duty also did not see the alert from the Salem HBD because he was working to resolve other, higher-priority alerts, but immediately seeing the Salem HBD alert would not have prevented the derailment; the train derailed before the analyst would have been required by NS procedures to take any actions.

The HBD in Salem, Ohio, was configured to take its temperature readings from the inner edge of the bearing cup. This configuration is intended to reduce the likelihood that railcar components will obstruct the HBD’s view of the bearing. However, changes in temperature take time to equalize across different bearing components, meaning that as a bearing begins to overheat, the interior of a bearing may be hotter than the exterior, and two points on the exterior may differ in temperature. The fire visible in surveillance camera images indicates that at least the outer edge of the bearing was hot enough to result in the combustion of grease or another flammable substance. Part of the bearing was therefore hotter than the 103°F temperature the HBD measured at the inner edge of the bearing cup. The temperature measurement, which was likely lower than the bearing’s actual highest temperature, resulted in a



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non-critical alert for a bearing that burned off and separated less than 20 miles later. The NTSB concludes that the non-critical alert transmitted by the Salem, Ohio, HBD did not reflect the true temperature and failing condition of the L1 wheel bearing.

It is unclear whether a different HBD design or configuration would have provided a more accurate measurement of the bearing's temperature. The NTSB's review of existing research on HBDs found that variations in railcar design pose significant challenges to measuring temperatures near the center or outer edge of the bearing cup; parts of the railcar's trucks can obstruct the HBD's field of view (Carter and Clasby 2017). Further, measuring a different or larger surface area of the bearing cup does not ensure that the measurement will include the hottest part of the bearing, which may be inside the bearing or outside the HBD's field of view. As discussed during the Investigative Hearing, changes in the exterior temperature of a bearing tend to lag behind changes in the interior temperature.<sup>117</sup> The NTSB concludes that a failing wheel bearing's actual internal temperatures will likely exceed external temperatures measured and reported by an HBD, and this limit on HBD accuracy is inherent in how current HBDs and railcar trucks are designed.

Following the non-critical alert transmitted by the Salem HBD, NS standard operating procedures required the employee staffing the Wayside Help Desk to monitor the L1 bearing as it traversed additional detectors and to determine whether the temperature trend required further action. However, the distance between the HBDs and the speed of bearing degradation were such that, by the time the train reached the next HBD, about 19 miles away in East Palestine, the L1 bearing was already failing. Its exterior temperature measurement had reached at least 253°F, more than 50°F above the critical bearing alarm threshold. The Wayside Help Desk procedures did not create an opportunity to notify the crew of a problem before the East Palestine HBD broadcast a critical alarm. The bearing separated less than a minute later, as the crew began to stop the train. The NTSB concludes that the combination of NS standard operating procedures that required only continued monitoring for non-critical bearing alerts, the limited ability of HBDs to measure a bearing's actual internal temperature, and the distance between detectors did not give the train's crew adequate warning to stop the train before the suspect bearing failed and caused the derailment.

At the NTSB's Investigative Hearing, the NS Assistant Vice President of Signals and Communications testified that NS based its alert and alarm temperature thresholds on its own experience with HBDs and AAR standards.<sup>118</sup> However, as the AAR Senior Vice President of Safety and Operations testified, the AAR definition of an overheated bearing is based on what makes a railcar repair billable to the railcar owner or lessor, and railroads choose their own temperature thresholds and operating procedures based on their experience balancing between preventing bearing failures and avoiding unnecessary stops. <sup>119</sup> It is unclear whether the AAR definition of an overheated bearing is an appropriate temperature threshold for a wayside defect detection system intended to prevent accidents, especially when some current detector technologies—such as the HBDs relevant to the East Palestine derailment—may not accurately measure a bearing's maximum temperature.

To determine whether NS's use of wayside bearing defect detectors was representative of general industry practice, the NTSB requested information from all the Class I railroads about their use of wayside bearing defect detectors. All six Class I railroads responded, and the results are summarized in table 7. All six Class I railroads reported using HBDs and ABDs, but they varied in alarm criteria, wayside equipment inspection and maintenance intervals, detector spacing, and plans for future deployments of HBDs and ABDs. The available information also described HBD deployment in terms of "average" spacing between detectors, which may mask additional variation. Depending on the exact locations of the HBDs, the average spacing may not be the typical spacing, and the maximum distance between HBDs may differ dramatically from the average. In the East Palestine derailment, the three HBDs of interest were an average of about 15 miles apart, but the interval between the Salem HBD and East Palestine HBD was about 19 miles, and the train derailed while traversing the East Palestine HBD. The maximum distance between detectors is therefore a useful metric in evaluating wayside bearing defect detection systems, but the current typical maximum is unclear.

The AAR does have recommended practices for HBD installation on key routes in its Circular OT-55-R, which specifies wayside defect detector spacing of 40 miles or less or "an equivalent level of protection based on improvements in technology" (AAR 2024a). However, the HBDs traversed by train 32N shortly before the derailment met this criterion, and the bearing that led to the derailment went from below the alert threshold to separated in about 30 miles. Further, this maximum applies only to key routes, and the option to install an "equivalent level of protection" invites the question of what level of protection a 40-mile maximum spacing provides compared to alternatives.

The NTSB acknowledges the positive impact of proven technologies such as HBDs and the growing use of newer technologies such as ABDs. However, the variations in wayside detector alarm criteria, configurations, and maintenance indicate that the rail industry has not reached a consensus on the optimal use and upkeep of wayside bearing defect detection systems. An AAR definition of an "overheated bearing" exists, but it relates to billing for repairs, not directly to safety or wayside detection. As the East Palestine



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derailment demonstrates, the successful use of wayside bearing defect detection systems depends on how these systems are implemented, including alert and alarm criteria that provide train crews with an opportunity to respond to overheating bearings before they fail. The performance of the HBD in Sebring, Ohio, also illustrates the importance of understanding each detection technology's limitations when planning and operating a wayside bearing defect detection system. Research into these subjects would provide a basis for a more informed approach to the use of bearing defect detection systems. The NTSB concludes that without research into how differences in alert and alarm thresholds and varied distances between detectors affect the performance of wayside bearing defect detection systems, railroads and regulators lack the information to determine what changes would produce significant safety improvements.

According to the database maintained by the FRA's Office of Safety Analysis, 69 of the 896 FRA-reportable rail accidents (7.7%) attributed to mechanical or electrical failures from 2020 through 2023 were caused by overheated wheel bearings, making overheated wheel bearings the single most common mechanical or electrical cause of accidents.<sup>120</sup> The accident count by year is summarized in table 15.

Because overheated wheel bearings are the single most common mechanical cause of accidents, the NTSB is concerned by the lack of industry consensus on a minimum standard for system configurations and related practices, including alert and alarm thresholds and operating rules. Further, the NTSB has identified additional bearing defect detection technologies undergoing testing and development, such as railcar-mounted bearing defect detectors, that may not share limitations specific to HBDs (Tarawneh, Montalvo, and Wilson 2021; Pams et al. 2024). The FRA has experience in fostering railroads' development and adoption of advanced safety technology, notably PTC, and is positioned to identify ways of improving bearing defect detection. Therefore, the NTSB recommends that the FRA research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. In addition to experience and expertise in working with industry partners, the FRA has the regulatory authority to set and enforce minimum safety requirements, and railroads must meet or exceed the level of safety provided by FRA regulations. The NTSB recommends that the FRA use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors.

However, even appropriate alert and alarm criteria are insufficient to protect safety if no alert is transmitted because of technical issues or if railroads do not respond effectively to alerts and alarms. In the months after the East Palestine derailment, the NTSB investigated two accidents in which a train traversed an HBD that detected an overheating bearing, but the wayside bearing defect detection system did not prevent a derailment from occurring shortly afterward.

The first derailment occurred on May 10, 2023, when NS freight train 14M in New Castle, Pennsylvania, derailed about 45 minutes after starting to traverse an HBD.<sup>121</sup> The HBD recorded a temperature of 253°F on the east-side bearing of the lead axle of the 164th railcar in the consist (line 167, a hopper car), a temperature high enough to trigger a critical alarm and critical alert, both of which require immediately stopping the train under NS operating rules. The NTSB reviewed radio transmission records and confirmed that the HBD transmitted a critical alarm. However, the NTSB's review of the locomotive data records showed that the alarm was not broadcast over the in-cab speakers, and the crew of train 14M was not warned that a bearing had overheated.<sup>122</sup> The NTSB also reviewed the Wayside Help Desk data logs and found that the desk did not receive an alert about the overheated bearing.

The NTSB's on-scene examination of the HBD determined that during maintenance, two transducers—critical components of the HBD that enable it to detect passing trains and count axles—had been removed and replaced in the wrong positions. The incorrectly positioned transducers prevented the HBD from communicating information to the Wayside Help Desk in a way the system could interpret and display. Even though the HBD correctly identified an overheated bearing, a pair of communication failures (one related to the improperly replaced transducers, the other of unknown causes) prevented the wayside bearing defect detection system from warning the crew of train 14M of a failed bearing.

The New Castle derailment illustrates the importance of test and inspection procedures adequate to identify compromised detectors. Currently, these practices are unregulated; the FRA has published guidance on wayside detection systems, but it has stopped short of imposing requirements (FRA 2019). However, railroads rely on wayside bearing defect detection systems for safe operation—much like signal systems, which the FRA regulates under 49 CFR Parts 235 and 236. Unlike the regulations for signal systems, there are no specific regulations for wayside bearing defect detectors prescribing intervals or standards for installation, inspection, testing, calibration, or general maintenance. The NTSB concludes that regulatory requirements for the installation, inspection, and maintenance of wayside bearing defect detectors would protect the reliability of these devices and improve the safety of railroad operations. Therefore, the NTSB recommends that the FRA establish requirements for the installation, inspection, and maintenance



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of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations.

The NTSB also investigated the July 6, 2023, derailment of an NS coal train near Elliston, Virginia. 123 In this accident, an HBD broadcast a critical alarm for a bearing on the lead axle of a the 71st railcar (line number 74, a gondola car), indicating a measured temperature of at least 170°F above ambient. When interviewed by the NTSB, the crew described how they stopped the train, confirmed a hot bearing using a temperature indicator stick, and communicated this confirmation to the Wayside Help Desk. 124 The Wayside Help Desk analyst directed them to set out the railcar for inspection. A dispatcher authorized the crew to move the train about 13 miles to a siding before setting out the suspect railcar for inspection. The derailment occurred during this movement while the train was traveling about 25 mph.

As a result of this derailment, NS issued an operations bulletin imposing additional speed and distance limits on moving equipment with suspect bearings. These improvements are confined to NS, and as indicated by the NTSB's survey of Class I railroads, operational responses to bearing alerts and alarms significantly vary by railroad. No publicly available research exists to support comparison of these varied responses, evaluate their effectiveness, and drive continuing improvements. The NTSB concludes that because the effectiveness of wayside bearing defect detection systems depends on appropriate operational responses, and because the rail industry has yet to arrive at a consensus standard for these responses, research is necessary to determine what operational responses to bearing alerts and alarms are sufficient to prevent bearing-related accidents. The NTSB also recommends that the FRA use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms.

| 01/10/25                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Addressee | Official Correspondence | 74119 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|-------|
| <p>-From Amit Bose, Administrator: This letter responds to your July 12, 2024, letter detailing the 10 Safety Recommendations the National Transportation Safety Board (NTSB) made to the Federal Railroad Administration (FRA) in its accident investigation report RRD23MR005, Norfolk Southern Railway Derailment and Hazardous Materials Release; East Palestine, Ohio; February 3, 2023. NTSB sent a copy of that report to FRA on July 12, 2024.</p> |           |                         |       |

In the "4. Recommendations" section of the report, NTSB issued to FRA Safety Recommendations R-24-02 through R-24-11, with Safety Recommendations R-24-02 through R-24-05 relating to hot bearing detectors (HBDs). Shortly after the East Palestine accident, FRA initiated a series of actions related to HBDs and wayside detectors in general. These actions, although initiated prior to NTSB's issuance of Recommendations R-24-02 through R-24-05, are relevant to those recommendations. Accordingly, FRA has included below a brief background section describing these actions. As FRA and NTSB representatives discussed on July 29, 2024, FRA has begun work to address the NTSB recommendations included in NTSB's July 12, 2024, letter, and a discussion of FRA's response to each recommendation is below.

Background on FRA's Activities Related to HBDs On March 3, 2023, in response to a series of rail accidents suspected of being caused by burnt journal bearings, including the East Palestine accident, FRA published Safety Advisory 2023-01 addressing the use and maintenance of HBDs. Footnote: 88 FR 13494 (Mar. 3, 2024).  
<https://railroads.dot.gov/elibrary/safety-advisory-2023-01-evaluation-policies-and-procedures-related-use-and-maintenance-hot>  
Since publication of that Safety Advisory, FRA has continued to evaluate railroads' use of HBDs. On June 14, 2023, following another accident suspected of resulting from a burnt journal bearing, FRA issued a supplement to Safety Advisory 2023-01 with the additional recommendation that railroads take action to evaluate the resiliency and accuracy of the overall process used to monitor and measure bearing health. Footnote: 88 FR 38933 (June 14, 2023).  
<https://www.federalregister.gov/documents/2023/06/14/2023-12724/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

On July 17, 2023, FRA issued a second supplement to Safety Advisory 2023-01 to reiterate and expand upon the recommendations in its previously published Safety Advisories related to HBDs. Footnote: 89 FR 58243 (July 17, 2024).  
<https://www.federalregister.gov/documents/2024/07/17/2024-15691/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>  
The second supplement reiterates FRA's previous recommendations in Safety Advisory 2023-01 and its July 17, 2023, supplement, and expands on the recommendations to incorporate the findings of ongoing FRA evaluations, including the ongoing investigations into recent accidents suspected of being caused by burnt journals and the finalization of the evaluation of data collected in FRA's High-Hazard Flammable Train Route Assessment (HHFT Route Assessment).

Footnote: FRA conducted the HHFT Route Assessment in response to direction from Secretary of Transportation Pete Buttigieg. The



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assessment included a focused inspection and evaluation of routes in the national rail network over which the largest volumes of hazardous materials are transported. As part of that assessment, FRA conducted an initial investigation and evaluation of industry practices, processes, and procedures related to wayside detector technology

<https://railroads.dot.gov/elibrary/high-hazard-flammable-train-route-assessment-legacy-tank-car-focused-inspection-program>

Specifically, the second supplement emphasizes:

- The importance of trend analysis and the opportunity to integrate wayside detector data types to evaluate railcar health;
- The need to establish and follow appropriate processes in analyzing and responding to HBD data;
- The need for railroads to ensure that adequate staff are assigned to monitor and respond to wayside detector data; and
- The need for railroads to maximize the use of HBD data, including sharing wayside detector data between railroads, as a train travels from one railroad to another.

FRA is closely monitoring railroads' implementation of the recommendations in this Safety Advisory and its supplements. At the same time, FRA is supporting the activities of the Railroad Safety Advisory Committee (RSAC), which is tasked with considering and reviewing issues related to wayside detectors, and HBDs in particular. The current RSAC task and the intended output are described below in FRA's response to Safety Recommendation R-24-02.

As noted previously, the RSAC Wayside Detector Working Group is considering issues related to wayside detectors, specifically HBDs, including analyzing existing regulations and guidance, accidents, incidents and performance data, safety complaints, and existing best practices. As discussed above, the anticipated output of the Working Group will be recommendations to create new regulations or revise existing regulations, and/or inform guidance regarding HBDs. Relevant to this recommendation, the Working Group will address HBD installation, inspection, and maintenance (including calibration procedures); the thresholds for alerts and trends; methods for monitoring and operational responses to alerts and trends; and the sharing of HBD health between railroads.

To date, the Working Group has compiled a list of all wayside detector types; categorized and identified priorities for the Working Group (hot bearing and hot wheel detectors); and agreed to a definition of wayside detectors (noting that "wayside detector" is not currently a defined term in FRA regulations).

The Working Group has also collected current practices relating to the installation, calibration, testing, maintenance, and inspection of wayside detectors from its members, as well as the communication methods and decision processes used by railroad mechanical desks. As discussed in response to R-24-02, the next step is preparing a best practice summary document, as well as documenting the communication and decision processes for hot boxes and HBDs, and associated detection reports. These actions will address the intent of Safety Recommendation R-24-04, and FRA requests that NTSB classify this recommendation as, "Open—Acceptable Response."



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |                                  |                                  |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | R-24-005 | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO THE FEDERAL RAILROAD ADMINISTRATION: Use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1        |                                  | <b>Overall Date Closed:</b>      | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | FRA      | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |
| <b>07/12/24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | NTSB     | Transmittal Letter               | 73264                            |          |
| The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbgov">http://www.ntsbgov</a> .                                                                                                                                                                                                                                                                                                                                                                             |          |                                  |                                  |          |
| The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, R-24-002 through R-24-011). We encourage you to submit your response to <a href="mailto:ExecutiveSecretariat@ntsb.gov">ExecutiveSecretariat@ntsb.gov</a> . If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response. |          |                                  |                                  |          |
| This letter provides information about the National Transportation Safety Board's (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbgov">http://www.ntsbgov</a> .                                                                                                                                                                                                                                                                                                                                     |          |                                  |                                  |          |
| As a result of this investigation, we identified the following safety issues:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |                                  |                                  |          |
| <ul style="list-style-type: none"><li>• Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;</li><li>• Inadequate emergency response training for volunteer first responders;</li><li>• Delayed transmittal of train consist information necessary to protect first responders and the public;</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                    |          |                                  |                                  |          |



# Recommendation Report

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- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Federal Railroad Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. (R-24-2) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors. (R-24-3) (See section 2.2.4.)
- Establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations. (R-24-4) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms. (R-24-5) (See section 2.2.4.)
- Monitor the progress of the Association of American Railroads' (AAR) action on R-24-20 and use your regulatory authority to ensure that the AAR addresses weaknesses in its tank car service equipment approval process. (R-24-6) (See section 2.4.3.1.)
- Distribute the public versions of your 2007 vent and burn reports to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-7) (See section 2.5.4.)
- Update and re publish your 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. (R-24-8) (See section 2.5.4.)
- Make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-9) (See section 2.5.4.)
- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. (R-24-10) (See section 2.6.)
- Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. If necessary, obtain legislative authority to act on this recommendation. (R-24-11) (See section 2.6.)



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In the same report, we also classified the following safety recommendations:

- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward and outward facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12 hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. (R 10 1)

Safety Recommendation R-10-1 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 10.

- Require that railroads regularly review and use in cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R 10 2)

Safety Recommendation R-10-2 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 11.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-2 through -11 and classified Safety Recommendations R-10-1 and -2). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 “Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023” published on July 12, 2024:

## 2.2.4 Bearing Failure Detection

The NTSB reviewed surveillance camera images along train 32N’s route and data from the last three HBDs it traversed before derailling. (See figure 29.) The first of these detectors, located in Sebring, Ohio, and about 30 miles west of the derailment site, did not record any bearing temperatures high enough to trigger an alert or alarm. Surveillance cameras in Sebring, Ohio, captured images of the train, and no anomalies were noted in the images.

The first clear indications of bearing deterioration were captured by surveillance cameras in Salem, Ohio, about 19 miles from the derailment site. Images from these cameras showed a fire on the L1 bearing of the hopper car.

Shortly after the train passed the field of view of these surveillance cameras, it traversed an HBD in Salem, Ohio, which recorded a temperature 103°F above ambient on the L1 bearing of the hopper car. This measurement was below the 170°F threshold that would have triggered an alarm broadcast to the train crew, which remained unaware that a bearing was showing unusual behavior. The measurement met the NS temperature criteria to trigger a non-critical alert at the NS ATC Wayside Help Desk. The non-critical alert identified the L1 bearing as needing continued monitoring: a trend analysis based on data from additional HBDs. Because train 32N derailed before it finished traversing the next HBD (in East Palestine), this trend analysis could not take place. The analyst on duty also did not see the alert from the Salem HBD because he was working to resolve other, higher-priority alerts, but immediately seeing the Salem HBD alert would not have prevented the derailment; the train derailed before the analyst would have been required by NS procedures to take any actions.

The HBD in Salem, Ohio, was configured to take its temperature readings from the inner edge of the bearing cup. This configuration is intended to reduce the likelihood that railcar components will obstruct the HBD’s view of the bearing. However, changes in temperature take time to equalize across different bearing components, meaning that as a bearing begins to overheat, the interior of a bearing may be hotter than the exterior, and two points on the exterior may differ in temperature. The fire visible in surveillance camera images indicates that at least the outer edge of the bearing was hot enough to result in the combustion of grease or another flammable substance. Part of the bearing was therefore hotter than the 103°F temperature the HBD measured at the inner edge of



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the bearing cup. The temperature measurement, which was likely lower than the bearing's actual highest temperature, resulted in a non-critical alert for a bearing that burned off and separated less than 20 miles later. The NTSB concludes that the non-critical alert transmitted by the Salem, Ohio, HBD did not reflect the true temperature and failing condition of the L1 wheel bearing.

It is unclear whether a different HBD design or configuration would have provided a more accurate measurement of the bearing's temperature. The NTSB's review of existing research on HBDs found that variations in railcar design pose significant challenges to measuring temperatures near the center or outer edge of the bearing cup; parts of the railcar's trucks can obstruct the HBDs field of view (Carter and Clasby 2017). Further, measuring a different or larger surface area of the bearing cup does not ensure that the measurement will include the hottest part of the bearing, which may be inside the bearing or outside the HBD's field of view. As discussed during the Investigative Hearing, changes in the exterior temperature of a bearing tend to lag behind changes in the interior temperature.<sup>117</sup> The NTSB concludes that a failing wheel bearing's actual internal temperatures will likely exceed external temperatures measured and reported by an HBD, and this limit on HBD accuracy is inherent in how current HBDs and railcar trucks are designed.

Following the non-critical alert transmitted by the Salem HBD, NS standard operating procedures required the employee staffing the Wayside Help Desk to monitor the L1 bearing as it traversed additional detectors and to determine whether the temperature trend required further action. However, the distance between the HBDs and the speed of bearing degradation were such that, by the time the train reached the next HBD, about 19 miles away in East Palestine, the L1 bearing was already failing. Its exterior temperature measurement had reached at least 253°F, more than 50°F above the critical bearing alarm threshold. The Wayside Help Desk procedures did not create an opportunity to notify the crew of a problem before the East Palestine HBD broadcast a critical alarm. The bearing separated less than a minute later, as the crew began to stop the train. The NTSB concludes that the combination of NS standard operating procedures that required only continued monitoring for non-critical bearing alerts, the limited ability of HBDs to measure a bearing's actual internal temperature, and the distance between detectors did not give the train's crew adequate warning to stop the train before the suspect bearing failed and caused the derailment.

At the NTSB's Investigative Hearing, the NS Assistant Vice President of Signals and Communications testified that NS based its alert and alarm temperature thresholds on its own experience with HBDs and AAR standards.<sup>118</sup> However, as the AAR Senior Vice President of Safety and Operations testified, the AAR definition of an overheated bearing is based on what makes a railcar repair billable to the railcar owner or lessor, and railroads choose their own temperature thresholds and operating procedures based on their experience balancing between preventing bearing failures and avoiding unnecessary stops. <sup>119</sup> It is unclear whether the AAR definition of an overheated bearing is an appropriate temperature threshold for a wayside defect detection system intended to prevent accidents, especially when some current detector technologies—such as the HBDs relevant to the East Palestine derailment—may not accurately measure a bearing's maximum temperature.

To determine whether NS's use of wayside bearing defect detectors was representative of general industry practice, the NTSB requested information from all the Class I railroads about their use of wayside bearing defect detectors. All six Class I railroads responded, and the results are summarized in table 7. All six Class I railroads reported using HBDs and ABDs, but they varied in alarm criteria, wayside equipment inspection and maintenance intervals, detector spacing, and plans for future deployments of HBDs and ABDs. The available information also described HBD deployment in terms of "average" spacing between detectors, which may mask additional variation. Depending on the exact locations of the HBDs, the average spacing may not be the typical spacing, and the maximum distance between HBDs may differ dramatically from the average. In the East Palestine derailment, the three HBDs of interest were an average of about 15 miles apart, but the interval between the Salem HBD and East Palestine HBD was about 19 miles, and the train derailed while traversing the East Palestine HBD. The maximum distance between detectors is therefore a useful metric in evaluating wayside bearing defect detection systems, but the current typical maximum is unclear.

The AAR does have recommended practices for HBD installation on key routes in its Circular OT-55-R, which specifies wayside defect detector spacing of 40 miles or less or "an equivalent level of protection based on improvements in technology" (AAR 2024a). However, the HBDs traversed by train 32N shortly before the derailment met this criterion, and the bearing that led to the derailment went from below the alert threshold to separated in about 30 miles. Further, this maximum applies only to key routes, and the option to install an "equivalent level of protection" invites the question of what level of protection a 40-mile maximum spacing provides compared to alternatives.

The NTSB acknowledges the positive impact of proven technologies such as HBDs and the growing use of newer technologies such as ABDs. However, the variations in wayside detector alarm criteria, configurations, and maintenance indicate that the rail industry has not reached a consensus on the optimal use and upkeep of wayside bearing defect detection systems. An AAR definition of an



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“overheated bearing” exists, but it relates to billing for repairs, not directly to safety or wayside detection. As the East Palestine derailment demonstrates, the successful use of wayside bearing defect detection systems depends on how these systems are implemented, including alert and alarm criteria that provide train crews with an opportunity to respond to overheating bearings before they fail. The performance of the HBD in Sebring, Ohio, also illustrates the importance of understanding each detection technology’s limitations when planning and operating a wayside bearing defect detection system. Research into these subjects would provide a basis for a more informed approach to the use of bearing defect detection systems. The NTSB concludes that without research into how differences in alert and alarm thresholds and varied distances between detectors affect the performance of wayside bearing defect detection systems, railroads and regulators lack the information to determine what changes would produce significant safety improvements.

According to the database maintained by the FRA’s Office of Safety Analysis, 69 of the 896 FRA-reportable rail accidents (7.7%) attributed to mechanical or electrical failures from 2020 through 2023 were caused by overheated wheel bearings, making overheated wheel bearings the single most common mechanical or electrical cause of accidents.<sup>120</sup> The accident count by year is summarized in table 15.

Because overheated wheel bearings are the single most common mechanical cause of accidents, the NTSB is concerned by the lack of industry consensus on a minimum standard for system configurations and related practices, including alert and alarm thresholds and operating rules. Further, the NTSB has identified additional bearing defect detection technologies undergoing testing and development, such as railcar-mounted bearing defect detectors, that may not share limitations specific to HBDs (Tarawneh, Montalvo, and Wilson 2021; Pams et al. 2024). The FRA has experience in fostering railroads’ development and adoption of advanced safety technology, notably PTC, and is positioned to identify ways of improving bearing defect detection. Therefore, the NTSB recommends that the FRA research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. In addition to experience and expertise in working with industry partners, the FRA has the regulatory authority to set and enforce minimum safety requirements, and railroads must meet or exceed the level of safety provided by FRA regulations. The NTSB recommends that the FRA use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors.

However, even appropriate alert and alarm criteria are insufficient to protect safety if no alert is transmitted because of technical issues or if railroads do not respond effectively to alerts and alarms. In the months after the East Palestine derailment, the NTSB investigated two accidents in which a train traversed an HBD that detected an overheating bearing, but the wayside bearing defect detection system did not prevent a derailment from occurring shortly afterward.

The first derailment occurred on May 10, 2023, when NS freight train 14M in New Castle, Pennsylvania, derailed about 45 minutes after starting to traverse an HBD.<sup>121</sup> The HBD recorded a temperature of 253°F on the east-side bearing of the lead axle of the 164th railcar in the consist (line 167, a hopper car), a temperature high enough to trigger a critical alarm and critical alert, both of which require immediately stopping the train under NS operating rules. The NTSB reviewed radio transmission records and confirmed that the HBD transmitted a critical alarm. However, the NTSB’s review of the locomotive data records showed that the alarm was not broadcast over the in-cab speakers, and the crew of train 14M was not warned that a bearing had overheated.<sup>122</sup> The NTSB also reviewed the Wayside Help Desk data logs and found that the desk did not receive an alert about the overheated bearing.

The NTSB’s on-scene examination of the HBD determined that during maintenance, two transducers—critical components of the HBD that enable it to detect passing trains and count axles—had been removed and replaced in the wrong positions. The incorrectly positioned transducers prevented the HBD from communicating information to the Wayside Help Desk in a way the system could interpret and display. Even though the HBD correctly identified an overheated bearing, a pair of communication failures (one related to the improperly replaced transducers, the other of unknown causes) prevented the wayside bearing defect detection system from warning the crew of train 14M of a failed bearing.

The New Castle derailment illustrates the importance of test and inspection procedures adequate to identify compromised detectors. Currently, these practices are unregulated; the FRA has published guidance on wayside detection systems, but it has stopped short of imposing requirements (FRA 2019). However, railroads rely on wayside bearing defect detection systems for safe operation—much like signal systems, which the FRA regulates under 49 CFR Parts 235 and 236. Unlike the regulations for signal systems, there are no specific regulations for wayside bearing defect detectors prescribing intervals or standards for installation, inspection, testing, calibration, or general maintenance. The NTSB concludes that regulatory requirements for the installation, inspection, and maintenance of wayside bearing defect detectors would protect the reliability of these devices and improve the safety of railroad



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operations. Therefore, the NTSB recommends that the FRA establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations.

The NTSB also investigated the July 6, 2023, derailment of an NS coal train near Elliston, Virginia. 123 In this accident, an HBD broadcast a critical alarm for a bearing on the lead axle of a the 71st railcar (line number 74, a gondola car), indicating a measured temperature of at least 170°F above ambient. When interviewed by the NTSB, the crew described how they stopped the train, confirmed a hot bearing using a temperature indicator stick, and communicated this confirmation to the Wayside Help Desk. 124 The Wayside Help Desk analyst directed them to set out the railcar for inspection. A dispatcher authorized the crew to move the train about 13 miles to a siding before setting out the suspect railcar for inspection. The derailment occurred during this movement while the train was traveling about 25 mph.

As a result of this derailment, NS issued an operations bulletin imposing additional speed and distance limits on moving equipment with suspect bearings. These improvements are confined to NS, and as indicated by the NTSB's survey of Class I railroads, operational responses to bearing alerts and alarms significantly vary by railroad. No publicly available research exists to support comparison of these varied responses, evaluate their effectiveness, and drive continuing improvements. The NTSB concludes that because the effectiveness of wayside bearing defect detection systems depends on appropriate operational responses, and because the rail industry has yet to arrive at a consensus standard for these responses, research is necessary to determine what operational responses to bearing alerts and alarms are sufficient to prevent bearing-related accidents. The NTSB also recommends that the FRA use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms.

01/10/25

Addressee

Official Correspondence

74119

-From Amit Bose, Administrator: This letter responds to your July 12, 2024, letter detailing the 10 Safety Recommendations the National Transportation Safety Board (NTSB) made to the Federal Railroad Administration (FRA) in its accident investigation report RRD23MR005, Norfolk Southern Railway Derailment and Hazardous Materials Release; East Palestine, Ohio; February 3, 2023. NTSB sent a copy of that report to FRA on July 12, 2024.

In the "4. Recommendations" section of the report, NTSB issued to FRA Safety Recommendations R-24-02 through R-24-11, with Safety Recommendations R-24-02 through R-24-05 relating to hot bearing detectors (HBDs). Shortly after the East Palestine accident, FRA initiated a series of actions related to HBDs and wayside detectors in general. These actions, although initiated prior to NTSB's issuance of Recommendations R-24-02 through R-24-05, are relevant to those recommendations. Accordingly, FRA has included below a brief background section describing these actions. As FRA and NTSB representatives discussed on July 29, 2024, FRA has begun work to address the NTSB recommendations included in NTSB's July 12, 2024, letter, and a discussion of FRA's response to each recommendation is below.

Background on FRA's Activities Related to HBDs On March 3, 2023, in response to a series of rail accidents suspected of being caused by burnt journal bearings, including the East Palestine accident, FRA published Safety Advisory 2023-01 addressing the use and maintenance of HBDs. Footnote: 88 FR 13494 (Mar. 3, 2024).

<https://railroads.dot.gov/elibrary/safety-advisory-2023-01-evaluation-policies-and-procedures-related-use-and-maintenance-hot> Since publication of that Safety Advisory, FRA has continued to evaluate railroads' use of HBDs. On June 14, 2023, following another accident suspected of resulting from a burnt journal bearing, FRA issued a supplement to Safety Advisory 2023-01 with the additional recommendation that railroads take action to evaluate the resiliency and accuracy of the overall process used to monitor and measure bearing health. Footnote: 88 FR 38933 (June 14, 2023).

<https://www.federalregister.gov/documents/2023/06/14/2023-12724/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

On July 17, 2023, FRA issued a second supplement to Safety Advisory 2023-01 to reiterate and expand upon the recommendations in its previously published Safety Advisories related to HBDs. Footnote: 89 FR 58243 (July 17, 2024).

<https://www.federalregister.gov/documents/2024/07/17/2024-15691/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

The second supplement reiterates FRA's previous recommendations in Safety Advisory 2023-01 and its July 17, 2023, supplement, and expands on the recommendations to incorporate the findings of ongoing FRA evaluations, including the ongoing investigations into recent accidents suspected of being caused by burnt journals and the finalization of the evaluation of data collected in FRA's High-Hazard Flammable Train Route Assessment (HHFT Route Assessment).



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Footnote: FRA conducted the HHFT Route Assessment in response to direction from Secretary of Transportation Pete Buttigieg. The assessment included a focused inspection and evaluation of routes in the national rail network over which the largest volumes of hazardous materials are transported. As part of that assessment, FRA conducted an initial investigation and evaluation of industry practices, processes, and procedures related to wayside detector technology

<https://railroads.dot.gov/elibrary/high-hazard-flammable-train-route-assessment-legacy-tank-car-focused-inspection-program>

Specifically, the second supplement emphasizes:

- The importance of trend analysis and the opportunity to integrate wayside detector data types to evaluate railcar health;
- The need to establish and follow appropriate processes in analyzing and responding to HBD data;
- The need for railroads to ensure that adequate staff are assigned to monitor and respond to wayside detector data; and
- The need for railroads to maximize the use of HBD data, including sharing wayside detector data between railroads, as a train travels from one railroad to another.

FRA is closely monitoring railroads' implementation of the recommendations in this Safety Advisory and its supplements. At the same time, FRA is supporting the activities of the Railroad Safety Advisory Committee (RSAC), which is tasked with considering and reviewing issues related to wayside detectors, and HBDs in particular. The current RSAC task and the intended output are described below in FRA's response to Safety Recommendation R-24-02.

As explained above, the RSAC Wayside Detector Working Group is evaluating industry's current best practices regarding operational responses to bearing alerts and alarms; this research will inform the Working Group's recommendations to the full RSAC, and FRA will use any resulting recommendations, as well as information and data gathered in the course of the Working Group's deliberations, to develop guidelines and/or regulations to govern railroads' operational responses to bearing detector alerts and alarms. These actions will address the intent of Safety Recommendation R-24-05, and FRA requests that NTSB classify this recommendation as, "Open—Acceptable Response."



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                                  |          |                                  |                                  |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                        | R-24-006 | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO THE FEDERAL RAILROAD ADMINISTRATION: Monitor the progress of the Association of American Railroads' (AAR) action on R-24-20 and use your regulatory authority to ensure that the AAR addresses weaknesses in its tank car service equipment approval process. |          |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                          | 1        |                                  | <b>Overall Date Closed:</b>      | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                | FRA      | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |                    |       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------|-------|
| <b>07/12/24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | NTSB | Transmittal Letter | 73264 |
| The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.nts.gov">http://www.nts.gov</a> .                                                                                                                                                                                                                                                                                                                                                                             |      |                    |       |
| The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, R-24-002 through R-24-011). We encourage you to submit your response to <a href="mailto:ExecutiveSecretariat@ntsb.gov">ExecutiveSecretariat@ntsb.gov</a> . If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response. |      |                    |       |
| This letter provides information about the National Transportation Safety Board's (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.nts.gov">http://www.nts.gov</a> .                                                                                                                                                                                                                                                                                                                                     |      |                    |       |
| As a result of this investigation, we identified the following safety issues:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |                    |       |
| <ul style="list-style-type: none"><li>• Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;</li><li>• Inadequate emergency response training for volunteer first responders;</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |                    |       |



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- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Federal Railroad Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. (R-24-2) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors. (R-24-3) (See section 2.2.4.)
- Establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations. (R-24-4) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms. (R-24-5) (See section 2.2.4.)
- Monitor the progress of the Association of American Railroads' (AAR) action on R-24-20 and use your regulatory authority to ensure that the AAR addresses weaknesses in its tank car service equipment approval process. (R-24-6) (See section 2.4.3.1.)
- Distribute the public versions of your 2007 vent and burn reports to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-7) (See section 2.5.4.)
- Update and re publish your 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. (R-24-8) (See section 2.5.4.)
- Make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-9) (See section 2.5.4.)
- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. (R-24-10) (See section 2.6.)
- Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. If necessary, obtain legislative authority to act on this recommendation. (R-24-11) (See section 2.6.)



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In the same report, we also classified the following safety recommendations:

- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward and outward facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12 hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. (R 10 1)

Safety Recommendation R-10-1 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 10.

- Require that railroads regularly review and use in cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R 10 2)

Safety Recommendation R-10-2 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 11.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-2 through -11 and classified Safety Recommendations R-10-1 and -2). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 “Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023” published on July 12, 2024:

## 2.4.3.1 Tank Car and Fittings Certification

Under 49 CFR 179.5, a tank car must have a certificate of construction before entering service. Under 49 CFR 179.3, applications for approval of designs, materials of construction, conversion, or alteration of tank car tanks, complete with detailed prints, must be considered and approved by the AAR Tank Car Committee or other appropriate committees before a certificate of construction can be issued. Applicants must specify commodities and certify that the tank car and its service equipment (such as PRDs) are compatible with the specified lading as described in the AAR MSRP, M-1002, Specifications for Tank Cars. The AAR also approves PRD designs through a separate process, which asks the applicant to specify the commodity with which the PRD will be used. Applicants must test a PRD’s flow rate using a test fluid such as steam, air, or natural gas. The AAR approval processes for tank cars and PRDs do not include independent evaluation of whether an applicant’s certification of compatibility is accurate.

Four of the five derailed VCM tank cars were certified for “vinyl chloride.” The fifth, GATX95098, was certified for “propylene oxide and products authorized in DOT 173 [sic] for which there are no special commodity requirements and nonregulated commodities compatible with this class of car.” VCM is a Division 2.1 flammable gas and is therefore subject to the special requirements of 49 CFR 173.314(j). However, the NTSB did not identify evidence that the tank car did not meet these requirements or that its original lading certification materially affected its suitability for use in VCM service or created a specific safety risk.

The certificates of construction for three of the VCM tank cars reference design drawings that specify aluminum components: for TILX402025, the version of a PRD with an aluminum-coated spring, and for OCPX80235 and OCPX80179, an aluminum protective housing cover. The NTSB’s postderailment examinations of the VCM tank cars also identified aluminum valve handwheels on tank car OCPX80370.

The Oxy Vinyls SDS for VCM lists aluminum as incompatible with VCM because it may result in violently exothermic (heat-producing) reactions. While expert testimony at the NTSB Investigative Hearing called into question the scientific basis for this incompatibility warning, the NTSB is concerned that tank cars certified for VCM service had protective housing covers, valve handwheels, and PRD



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components made of a material specifically described as incompatible by the lading's SDS.<sup>145</sup> There is no evidence that the AAR Tank Car Committee or any third-party approver took note of this incompatibility or raised concerns, and the five derailed tank cars transporting VCM were in service with aluminum components.

The current approval process for certificates of construction depends on the accuracy of manufacturers' own representations of their products' compatibility with ladings and compliance with regulations. The AAR does not appear to consistently verify these representations through independent testing, reference to relevant scientific literature, or demonstration. The AAR's approval process was insufficient to prevent the VCM tank cars involved in the East Palestine derailment from being certified despite the possible incompatibility of fittings with the specified lading. The NTSB concludes that the current AAR tank car certificate of construction approval process lacks a means of verifying manufacturers' claims and is therefore insufficient to ensure that tank cars and their fittings are appropriate for their specified lading. The AAR's current review process cannot reliably identify tank cars whose fittings may be incompatible with the specified lading, creating safety hazards that could be avoided by more careful review, appropriate testing, or use of SDSs and other sources of hazard information. The NTSB recommends that the AAR revise the MSRP, M-1002, Specifications for Tank Cars, to establish criteria and procedures for manufacturers of tank car service equipment to demonstrate compatibility of PRDs and other AAR-approved service equipment with intended ladings. The NTSB also recommends that the FRA monitor the progress of the AAR's action on R-24-20 and use its regulatory authority to ensure that the AAR addresses weaknesses in its tank car service equipment approval process.

01/10/25

Addressee

Official Correspondence

74119

-From Amit Bose, Administrator: This letter responds to your July 12, 2024, letter detailing the 10 Safety Recommendations the National Transportation Safety Board (NTSB) made to the Federal Railroad Administration (FRA) in its accident investigation report RRD23MR005, Norfolk Southern Railway Derailment and Hazardous Materials Release; East Palestine, Ohio; February 3, 2023. NTSB sent a copy of that report to FRA on July 12, 2024.

In the "4. Recommendations" section of the report, NTSB issued to FRA Safety Recommendations R-24-02 through R-24-11, with Safety Recommendations R-24-02 through R-24-05 relating to hot bearing detectors (HBDs). Shortly after the East Palestine accident, FRA initiated a series of actions related to HBDs and wayside detectors in general. These actions, although initiated prior to NTSB's issuance of Recommendations R-24-02 through R-24-05, are relevant to those recommendations. Accordingly, FRA has included below a brief background section describing these actions. As FRA and NTSB representatives discussed on July 29, 2024, FRA has begun work to address the NTSB recommendations included in NTSB's July 12, 2024, letter, and a discussion of FRA's response to each recommendation is below.

Background on FRA's Activities Related to HBDs On March 3, 2023, in response to a series of rail accidents suspected of being caused by burnt journal bearings, including the East Palestine accident, FRA published Safety Advisory 2023-01 addressing the use and maintenance of HBDs. Footnote: 88 FR 13494 (Mar. 3, 2024).

<https://railroads.dot.gov/elibrary/safety-advisory-2023-01-evaluation-policies-and-procedures-related-use-and-maintenance-hot> Since publication of that Safety Advisory, FRA has continued to evaluate railroads' use of HBDs. On June 14, 2023, following another accident suspected of resulting from a burnt journal bearing, FRA issued a supplement to Safety Advisory 2023-01 with the additional recommendation that railroads take action to evaluate the resiliency and accuracy of the overall process used to monitor and measure bearing health. Footnote: 88 FR 38933 (June 14, 2023).

<https://www.federalregister.gov/documents/2023/06/14/2023-12724/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

On July 17, 2023, FRA issued a second supplement to Safety Advisory 2023-01 to reiterate and expand upon the recommendations in its previously published Safety Advisories related to HBDs. Footnote: 89 FR 58243 (July 17, 2024).

<https://www.federalregister.gov/documents/2024/07/17/2024-15691/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

The second supplement reiterates FRA's previous recommendations in Safety Advisory 2023-01 and its July 17, 2023, supplement, and expands on the recommendations to incorporate the findings of ongoing FRA evaluations, including the ongoing investigations into recent accidents suspected of being caused by burnt journals and the finalization of the evaluation of data collected in FRA's High-Hazard Flammable Train Route Assessment (HHFT Route Assessment).

Footnote: FRA conducted the HHFT Route Assessment in response to direction from Secretary of Transportation Pete Buttigieg. The assessment included a focused inspection and evaluation of routes in the national rail network over which the largest volumes of hazardous materials are transported. As part of that assessment, FRA conducted an initial investigation and evaluation of industry



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practices, processes, and procedures related to wayside detector technology

<https://railroads.dot.gov/elibrary/high-hazard-flammable-train-route-assessment-legacy-tank-car-focused-inspection-program>

Specifically, the second supplement emphasizes:

- The importance of trend analysis and the opportunity to integrate wayside detector data types to evaluate railcar health;
- The need to establish and follow appropriate processes in analyzing and responding to HBD data;
- The need for railroads to ensure that adequate staff are assigned to monitor and respond to wayside detector data; and
- The need for railroads to maximize the use of HBD data, including sharing wayside detector data between railroads, as a train travels from one railroad to another.

FRA is closely monitoring railroads' implementation of the recommendations in this Safety Advisory and its supplements. At the same time, FRA is supporting the activities of the Railroad Safety Advisory Committee (RSAC), which is tasked with considering and reviewing issues related to wayside detectors, and HBDs in particular. The current RSAC task and the intended output are described below in FRA's response to Safety Recommendation R-24-02.

FRA will continue its oversight of the Association of American Railroads (AAR) Tank Car Committee (TCC), with a focus on addressing any weaknesses in the service equipment approval process. Additionally, the Pipeline and Hazardous Materials Safety Administration (PHMSA) published a notice of proposed rulemaking proposing revisions to the provisions in the Hazardous Materials Regulations (HMR) delegating authority to approve tank car designs to the AAR TCC,<sup>6</sup> and proposing revisions to the HMR to strengthen the current service equipment approval process. FRA requests that NTSB classify this recommendation as, "Open—Acceptable Response."



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                                                                 |          |                             |                                  |          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                       | R-24-007 | <b>Overall Status:</b>      | Open - Initial Response Received | CLASS II |
| TO THE FEDERAL RAILROAD ADMINISTRATION: Distribute the public versions of your 2007 vent and burn reports to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. |          |                             |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                         | 1        | <b>Overall Date Closed:</b> | N/A                              |          |

|                   |     |                                  |                     |     |
|-------------------|-----|----------------------------------|---------------------|-----|
| <b>Addressee:</b> | FRA | Open - Initial Response Received | <b>Date Closed:</b> | N/A |
|-------------------|-----|----------------------------------|---------------------|-----|

|                 |      |                    |       |
|-----------------|------|--------------------|-------|
| <b>07/12/24</b> | NTSB | Transmittal Letter | 73264 |
|-----------------|------|--------------------|-------|

The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.nts.gov>.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, R-24-002 through R-24-011). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

This letter provides information about the National Transportation Safety Board's (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.nts.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;



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- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Federal Railroad Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. (R-24-2) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors. (R-24-3) (See section 2.2.4.)
- Establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations. (R-24-4) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms. (R-24-5) (See section 2.2.4.)
- Monitor the progress of the Association of American Railroads' (AAR) action on R-24-20 and use your regulatory authority to ensure that the AAR addresses weaknesses in its tank car service equipment approval process. (R-24-6) (See section 2.4.3.1.)
- Distribute the public versions of your 2007 vent and burn reports to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-7) (See section 2.5.4.)
- Update and re publish your 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. (R-24-8) (See section 2.5.4.)
- Make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-9) (See section 2.5.4.)
- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. (R-24-10) (See section 2.6.)
- Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. If necessary, obtain legislative authority to act on this recommendation. (R-24-11) (See section 2.6.)



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In the same report, we also classified the following safety recommendations:

- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward and outward facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12 hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. (R 10 1)

Safety Recommendation R-10-1 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 10.

- Require that railroads regularly review and use in cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R 10 2)

Safety Recommendation R-10-2 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 11.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-2 through -11 and classified Safety Recommendations R-10-1 and -2). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.4 Vent and Burn Criteria

The FRA recognizes the vent and burn method as a valid but high-risk last-resort procedure for unloading tank cars transporting at least certain compressed liquified flammable gases, as shown by its 1994 and 2007 guidance on the method. The second 2007 report (Phase II of the associated study) includes guidance on when a vent and burn should be considered, what commodities are candidates for the procedure, and how an incident command should approach the decision (FRA 2007a). At least one individual involved in the East Palestine emergency response had knowledge of the 2007 study and Phase II report; the NS regional hazardous materials manager, then employed by the AAR, was one of the contributing authors. However, there is no evidence that the specific guidance in the Phase II report was used during the vent and burn decision, and the incident commander was not aware of the report's existence. Even if he had known about the report, he would not have had ready access to it because of the report's status as Sensitive Security Information. While it is unclear whether access to the Phase II report would have led the incident commander to a different decision, the report would have provided him with additional information and the tools needed to ask further questions of NS and its contractors. The Phase II report's guidance, cautions, and checklists would have provided the incident commander with additional knowledge and resources when deciding whether to approve the vent and burn. The presence of public, well-known criteria for when to attempt vent and burn procedures would also have provided a baseline for conversations among NS, its contractors, and the rest of the incident command.

On May 6, 2007, the FRA released publicly available versions of the Phase I and Phase II reports on its website, but web publication may not be sufficient to distribute this guidance. The 1994 handbook was available on the FRA's website at the time of the East Palestine derailment but was not consulted during the lead-up to the vent and burn. The NTSB is concerned that the FRA's most recent and complete guidance about when to attempt the vent and burn method has not been widely disseminated to emergency responders. A vent and burn procedure was not necessary in East Palestine to prevent a BLEVE, but what was true in East Palestine may not hold in other circumstances or for other products. The NTSB concludes that the significant local and environmental impacts of a vent and burn decision demonstrate the need for federal guidance about what products and circumstances are candidates for the vent and burn method. The NTSB recommends that the FRA distribute the public versions of its 2007 vent and burn reports to



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emergency responder associations, including the IAFC, IAFF, and NVFC. To increase awareness of federal guidance, the NTSB recommends that the IAFC, IAFF, and NVFC advise their members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate.

While the 2007 reports contain useful guidance, they were developed before the East Palestine vent and burn and therefore do not incorporate lessons learned from that accident. The Phase II report does not advise an incident command to contact the shipper when considering a vent and burn, for example, instead directing the incident commander to a database that has not been widely distributed. The checklist provided in the Phase II report does not always clearly indicate how the answers to its questions should shape a vent and burn decision. For example, it includes a row for product viscosity (high, medium, or low) but does not clearly explain how an incident command can determine viscosities or how different viscosities will affect a vent and burn (FRA 2007a). The NTSB recommends that the FRA update and re-publish its 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re-published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. The NTSB also recommends that the FRA make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the IAFC, IAFF, and NVFC. The NTSB also recommends that PHMSA distribute the FRA's most current guidance on the vent and burn method to emergency response agencies by referencing it in the next edition of the ERG.

01/10/25

Addressee

Official Correspondence

74119

-From Amit Bose, Administrator: This letter responds to your July 12, 2024, letter detailing the 10 Safety Recommendations the National Transportation Safety Board (NTSB) made to the Federal Railroad Administration (FRA) in its accident investigation report RRD23MR005, Norfolk Southern Railway Derailment and Hazardous Materials Release; East Palestine, Ohio; February 3, 2023. NTSB sent a copy of that report to FRA on July 12, 2024.

In the "4. Recommendations" section of the report, NTSB issued to FRA Safety Recommendations R-24-02 through R-24-11, with Safety Recommendations R-24-02 through R-24-05 relating to hot bearing detectors (HBDs). Shortly after the East Palestine accident, FRA initiated a series of actions related to HBDs and wayside detectors in general. These actions, although initiated prior to NTSB's issuance of Recommendations R-24-02 through R-24-05, are relevant to those recommendations. Accordingly, FRA has included below a brief background section describing these actions. As FRA and NTSB representatives discussed on July 29, 2024, FRA has begun work to address the NTSB recommendations included in NTSB's July 12, 2024, letter, and a discussion of FRA's response to each recommendation is below.

Background on FRA's Activities Related to HBDs On March 3, 2023, in response to a series of rail accidents suspected of being caused by burnt journal bearings, including the East Palestine accident, FRA published Safety Advisory 2023-01 addressing the use and maintenance of HBDs. Footnote: 88 FR 13494 (Mar. 3, 2024).

<https://railroads.dot.gov/elibrary/safety-advisory-2023-01-evaluation-policies-and-procedures-related-use-and-maintenance-hot> Since publication of that Safety Advisory, FRA has continued to evaluate railroads' use of HBDs. On June 14, 2023, following another accident suspected of resulting from a burnt journal bearing, FRA issued a supplement to Safety Advisory 2023-01 with the additional recommendation that railroads take action to evaluate the resiliency and accuracy of the overall process used to monitor and measure bearing health. Footnote: 88 FR 38933 (June 14, 2023).

<https://www.federalregister.gov/documents/2023/06/14/2023-12724/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

On July 17, 2023, FRA issued a second supplement to Safety Advisory 2023-01 to reiterate and expand upon the recommendations in its previously published Safety Advisories related to HBDs. Footnote: 89 FR 58243 (July 17, 2024).

<https://www.federalregister.gov/documents/2024/07/17/2024-15691/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

The second supplement reiterates FRA's previous recommendations in Safety Advisory 2023-01 and its July 17, 2023, supplement, and expands on the recommendations to incorporate the findings of ongoing FRA evaluations, including the ongoing investigations into recent accidents suspected of being caused by burnt journals and the finalization of the evaluation of data collected in FRA's High-Hazard Flammable Train Route Assessment (HHFT Route Assessment).

Footnote: FRA conducted the HHFT Route Assessment in response to direction from Secretary of Transportation Pete Buttigieg. The



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assessment included a focused inspection and evaluation of routes in the national rail network over which the largest volumes of hazardous materials are transported. As part of that assessment, FRA conducted an initial investigation and evaluation of industry practices, processes, and procedures related to wayside detector technology

<https://railroads.dot.gov/elibrary/high-hazard-flammable-train-route-assessment-legacy-tank-car-focused-inspection-program>

Specifically, the second supplement emphasizes:

- The importance of trend analysis and the opportunity to integrate wayside detector data types to evaluate railcar health;
- The need to establish and follow appropriate processes in analyzing and responding to HBD data;
- The need for railroads to ensure that adequate staff are assigned to monitor and respond to wayside detector data; and
- The need for railroads to maximize the use of HBD data, including sharing wayside detector data between railroads, as a train travels from one railroad to another.

FRA is closely monitoring railroads' implementation of the recommendations in this Safety Advisory and its supplements. At the same time, FRA is supporting the activities of the Railroad Safety Advisory Committee (RSAC), which is tasked with considering and reviewing issues related to wayside detectors, and HBDs in particular. The current RSAC task and the intended output are described below in FRA's response to Safety Recommendation R-24-02.

On August 8, 2024, FRA distributed copies of the 2007 vent and burn reports to the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council (see attached e-mail). FRA also provided copies of these reports to other emergency response and emergency planning organizations, including the Federal Emergency Management Agency (FEMA), the U.S. Environmental Protection Agency (EPA), and National Fire Protection Association (NFPA). To facilitate further distribution, the reports are available on FRA's public website at:

- The "Tank Car Vent and Burn Process Study: Phase I" may be found at: [https://railroads.dot.gov/sites/fra.dot.gov/files/2024-05/DOT\\_FRA\\_ORD-07-26\\_Vent\\_Burn\\_I\\_Report.pdf](https://railroads.dot.gov/sites/fra.dot.gov/files/2024-05/DOT_FRA_ORD-07-26_Vent_Burn_I_Report.pdf).
- The "Tank Car Vent and Burn Process Study: Phase II" may be found at: [https://railroads.dot.gov/sites/fra.dot.gov/files/2024-05/DOT\\_FRA\\_ORD-07-27\\_Vent\\_Burn\\_II\\_Report.pdf](https://railroads.dot.gov/sites/fra.dot.gov/files/2024-05/DOT_FRA_ORD-07-27_Vent_Burn_II_Report.pdf).

Because FRA has taken the action NTSB recommended in R-24-07, FRA requests that NTSB close this recommendation.



# Recommendation Report

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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |                    |                                  |                                  |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------|----------------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      | R-24-008           | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO THE FEDERAL RAILROAD ADMINISTRATION: Update and re publish your 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision.                                                          |      |                    |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |      | 1                  |                                  | <b>Overall Date Closed:</b>      | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      | FRA                | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |
| <b>07/12/24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | NTSB | Transmittal Letter | 73264                            |                                  |          |
| The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbgov">http://www.ntsbgov</a> .                                                                                                                                                                                                                                                                                                                         |      |                    |                                  |                                  |          |
| The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, R-24-002 through R-24-011). We encourage you to submit your response to ExecutiveSecretariat@ntsb.gov. If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response. |      |                    |                                  |                                  |          |
| This letter provides information about the National Transportation Safety Board’s (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbgov">http://www.ntsbgov</a> .                                                                                                                                                                                                                                                                                 |      |                    |                                  |                                  |          |
| As a result of this investigation, we identified the following safety issues:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |                    |                                  |                                  |          |
| • Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |      |                    |                                  |                                  |          |



# Recommendation Report

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- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Federal Railroad Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. (R-24-2) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors. (R-24-3) (See section 2.2.4.)
- Establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations. (R-24-4) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms. (R-24-5) (See section 2.2.4.)
- Monitor the progress of the Association of American Railroads' (AAR) action on R-24-20 and use your regulatory authority to ensure that the AAR addresses weaknesses in its tank car service equipment approval process. (R-24-6) (See section 2.4.3.1.)
- Distribute the public versions of your 2007 vent and burn reports to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-7) (See section 2.5.4.)
- Update and re publish your 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. (R-24-8) (See section 2.5.4.)
- Make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-9) (See section 2.5.4.)
- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. (R-24-10) (See section 2.6.)



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- Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. If necessary, obtain legislative authority to act on this recommendation. (R-24-11) (See section 2.6.)

In the same report, we also classified the following safety recommendations:

- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward and outward facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12 hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. (R 10 1)

Safety Recommendation R-10-1 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 10.

- Require that railroads regularly review and use in cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R 10 2)

Safety Recommendation R-10-2 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 11.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-2 through -11 and classified Safety Recommendations R-10-1 and -2). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 “Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023” published on July 12, 2024:

## 2.5.4 Vent and Burn Criteria

The FRA recognizes the vent and burn method as a valid but high-risk last-resort procedure for unloading tank cars transporting at least certain compressed liquified flammable gases, as shown by its 1994 and 2007 guidance on the method. The second 2007 report (Phase II of the associated study) includes guidance on when a vent and burn should be considered, what commodities are candidates for the procedure, and how an incident command should approach the decision (FRA 2007a). At least one individual involved in the East Palestine emergency response had knowledge of the 2007 study and Phase II report; the NS regional hazardous materials manager, then employed by the AAR, was one of the contributing authors. However, there is no evidence that the specific guidance in the Phase II report was used during the vent and burn decision, and the incident commander was not aware of the report’s existence. Even if he had known about the report, he would not have had ready access to it because of the report’s status as Sensitive Security Information. While it is unclear whether access to the Phase II report would have led the incident commander to a different decision, the report would have provided him with additional information and the tools needed to ask further questions of NS and its contractors. The Phase II report’s guidance, cautions, and checklists would have provided the incident commander with additional knowledge and resources when deciding whether to approve the vent and burn. The presence of public, well-known criteria for when to attempt vent and burn procedures would also have provided a baseline for conversations among NS, its contractors, and the rest of the incident command.

On May 6, 2007, the FRA released publicly available versions of the Phase I and Phase II reports on its website, but web publication may not be sufficient to distribute this guidance. The 1994 handbook was available on the FRA’s website at the time of the East Palestine derailment but was not consulted during the lead-up to the vent and burn. The NTSB is concerned that the FRA’s most recent and complete guidance about when to attempt the vent and burn method has not been widely disseminated to emergency responders. A vent and burn procedure was not necessary in East Palestine to prevent a BLEVE, but what was true in East Palestine



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may not hold in other circumstances or for other products. The NTSB concludes that the significant local and environmental impacts of a vent and burn decision demonstrate the need for federal guidance about what products and circumstances are candidates for the vent and burn method. The NTSB recommends that the FRA distribute the public versions of its 2007 vent and burn reports to emergency responder associations, including the IAFC, IAFF, and NVFC. To increase awareness of federal guidance, the NTSB recommends that the IAFC, IAFF, and NVFC advise their members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate.

While the 2007 reports contain useful guidance, they were developed before the East Palestine vent and burn and therefore do not incorporate lessons learned from that accident. The Phase II report does not advise an incident command to contact the shipper when considering a vent and burn, for example, instead directing the incident commander to a database that has not been widely distributed. The checklist provided in the Phase II report does not always clearly indicate how the answers to its questions should shape a vent and burn decision. For example, it includes a row for product viscosity (high, medium, or low) but does not clearly explain how an incident command can determine viscosities or how different viscosities will affect a vent and burn (FRA 2007a). The NTSB recommends that the FRA update and re-publish its 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re-published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. The NTSB also recommends that the FRA make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the IAFC, IAFF, and NVFC. The NTSB also recommends that PHMSA distribute the FRA's most current guidance on the vent and burn method to emergency response agencies by referencing it in the next edition of the ERG.

**01/10/25**

Addressee

Official Correspondence

74119

-From Amit Bose, Administrator: This letter responds to your July 12, 2024, letter detailing the 10 Safety Recommendations the National Transportation Safety Board (NTSB) made to the Federal Railroad Administration (FRA) in its accident investigation report RRD23MR005, Norfolk Southern Railway Derailment and Hazardous Materials Release; East Palestine, Ohio; February 3, 2023. NTSB sent a copy of that report to FRA on July 12, 2024.

In the "4. Recommendations" section of the report, NTSB issued to FRA Safety Recommendations R-24-02 through R-24-11, with Safety Recommendations R-24-02 through R-24-05 relating to hot bearing detectors (HBDs). Shortly after the East Palestine accident, FRA initiated a series of actions related to HBDs and wayside detectors in general. These actions, although initiated prior to NTSB's issuance of Recommendations R-24-02 through R-24-05, are relevant to those recommendations. Accordingly, FRA has included below a brief background section describing these actions. As FRA and NTSB representatives discussed on July 29, 2024, FRA has begun work to address the NTSB recommendations included in NTSB's July 12, 2024, letter, and a discussion of FRA's response to each recommendation is below.

Background on FRA's Activities Related to HBDs On March 3, 2023, in response to a series of rail accidents suspected of being caused by burnt journal bearings, including the East Palestine accident, FRA published Safety Advisory 2023-01 addressing the use and maintenance of HBDs. Footnote: 88 FR 13494 (Mar. 3, 2024).  
<https://railroads.dot.gov/elibrary/safety-advisory-2023-01-evaluation-policies-and-procedures-related-use-and-maintenance-hot>  
Since publication of that Safety Advisory, FRA has continued to evaluate railroads' use of HBDs. On June 14, 2023, following another accident suspected of resulting from a burnt journal bearing, FRA issued a supplement to Safety Advisory 2023-01 with the additional recommendation that railroads take action to evaluate the resiliency and accuracy of the overall process used to monitor and measure bearing health. Footnote: 88 FR 38933 (June 14, 2023).  
<https://www.federalregister.gov/documents/2023/06/14/2023-12724/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

On July 17, 2023, FRA issued a second supplement to Safety Advisory 2023-01 to reiterate and expand upon the recommendations in its previously published Safety Advisories related to HBDs. Footnote: 89 FR 58243 (July 17, 2024).  
<https://www.federalregister.gov/documents/2024/07/17/2024-15691/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

The second supplement reiterates FRA's previous recommendations in Safety Advisory 2023-01 and its July 17, 2023, supplement, and expands on the recommendations to incorporate the findings of ongoing FRA evaluations, including the ongoing investigations into recent accidents suspected of being caused by burnt journals and the finalization of the evaluation of data collected in FRA's



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High-Hazard Flammable Train Route Assessment (HHFT Route Assessment).

Footnote: FRA conducted the HHFT Route Assessment in response to direction from Secretary of Transportation Pete Buttigieg. The assessment included a focused inspection and evaluation of routes in the national rail network over which the largest volumes of hazardous materials are transported. As part of that assessment, FRA conducted an initial investigation and evaluation of industry practices, processes, and procedures related to wayside detector technology

<https://railroads.dot.gov/elibrary/high-hazard-flammable-train-route-assessment-legacy-tank-car-focused-inspection-program>

Specifically, the second supplement emphasizes:

- The importance of trend analysis and the opportunity to integrate wayside detector data types to evaluate railcar health;
- The need to establish and follow appropriate processes in analyzing and responding to HBD data;
- The need for railroads to ensure that adequate staff are assigned to monitor and respond to wayside detector data; and
- The need for railroads to maximize the use of HBD data, including sharing wayside detector data between railroads, as a train travels from one railroad to another.

FRA is closely monitoring railroads' implementation of the recommendations in this Safety Advisory and its supplements. At the same time, FRA is supporting the activities of the Railroad Safety Advisory Committee (RSAC), which is tasked with considering and reviewing issues related to wayside detectors, and HBDs in particular. The current RSAC task and the intended output are described below in FRA's response to Safety Recommendation R-24-02.

FRA has initiated an update to amend and modernize the 2007 vent and burn reports. FRA is conducting this effort in two phases. Phase I will focus on: (1) reviewing and updating the list of commodities that are candidates for this mitigation technique and the chemical and other hazards that may result; (2) updating and expanding on tank car damage assessment and the critical elements that must be considered in determining if the vent and burn mitigation technique is a necessary recommendation to Incident Command; and (3) updating process flow charts based on lessons learned from East Palestine and other past incidents.

Phase II will focus on how a railroad's recommendation to use the vent and burn mitigation technique is then evaluated and processed by Incident Command. Stakeholders that will be involved in this phase will include the International Association of Fire Chiefs (IAFC), the International Association of Fire Fighters (IAFF), the National Volunteer Fire Council (NVFC), the Department of Homeland Security/Federal Emergency Management Agency (DHS/FEMA), the U.S. Environmental Protection Agency (EPA), and others as identified. Additional project details are still being developed, and this project is expected to start during first quarter FY-2025.

FRA believes this project will take approximately 18-24 months to complete. FRA requests that NTSB classify this recommendation as, "Open—Acceptable Response."



# Recommendation Report

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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                                                                                         |          |                        |                                  |          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                               | R-24-009 | <b>Overall Status:</b> | Open - Initial Response Received | CLASS II |
| TO THE FEDERAL RAILROAD ADMINISTRATION: Make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. |          |                        |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                 | 1        |                        | <b>Overall Date Closed:</b>      | N/A      |

|                   |     |                                  |                     |     |
|-------------------|-----|----------------------------------|---------------------|-----|
| <b>Addressee:</b> | FRA | Open - Initial Response Received | <b>Date Closed:</b> | N/A |
|-------------------|-----|----------------------------------|---------------------|-----|

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|-----------------|------|--------------------|-------|
| <b>07/12/24</b> | NTSB | Transmittal Letter | 73264 |
|-----------------|------|--------------------|-------|

The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsbt.gov>.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, R-24-002 through R-24-011). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

This letter provides information about the National Transportation Safety Board's (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsbt.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;



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- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Federal Railroad Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. (R-24-2) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors. (R-24-3) (See section 2.2.4.)
- Establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations. (R-24-4) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms. (R-24-5) (See section 2.2.4.)
- Monitor the progress of the Association of American Railroads' (AAR) action on R-24-20 and use your regulatory authority to ensure that the AAR addresses weaknesses in its tank car service equipment approval process. (R-24-6) (See section 2.4.3.1.)
- Distribute the public versions of your 2007 vent and burn reports to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-7) (See section 2.5.4.)
- Update and re publish your 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. (R-24-8) (See section 2.5.4.)
- Make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-9) (See section 2.5.4.)
- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. (R-24-10) (See section 2.6.)
- Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. If necessary, obtain legislative authority to act on this recommendation. (R-24-11) (See section 2.6.)



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In the same report, we also classified the following safety recommendations:

- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward and outward facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12 hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. (R 10 1)

Safety Recommendation R-10-1 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 10.

- Require that railroads regularly review and use in cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R 10 2)

Safety Recommendation R-10-2 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 11.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-2 through -11 and classified Safety Recommendations R-10-1 and -2). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.4 Vent and Burn Criteria

The FRA recognizes the vent and burn method as a valid but high-risk last-resort procedure for unloading tank cars transporting at least certain compressed liquified flammable gases, as shown by its 1994 and 2007 guidance on the method. The second 2007 report (Phase II of the associated study) includes guidance on when a vent and burn should be considered, what commodities are candidates for the procedure, and how an incident command should approach the decision (FRA 2007a). At least one individual involved in the East Palestine emergency response had knowledge of the 2007 study and Phase II report; the NS regional hazardous materials manager, then employed by the AAR, was one of the contributing authors. However, there is no evidence that the specific guidance in the Phase II report was used during the vent and burn decision, and the incident commander was not aware of the report's existence. Even if he had known about the report, he would not have had ready access to it because of the report's status as Sensitive Security Information. While it is unclear whether access to the Phase II report would have led the incident commander to a different decision, the report would have provided him with additional information and the tools needed to ask further questions of NS and its contractors. The Phase II report's guidance, cautions, and checklists would have provided the incident commander with additional knowledge and resources when deciding whether to approve the vent and burn. The presence of public, well-known criteria for when to attempt vent and burn procedures would also have provided a baseline for conversations among NS, its contractors, and the rest of the incident command.

On May 6, 2007, the FRA released publicly available versions of the Phase I and Phase II reports on its website, but web publication may not be sufficient to distribute this guidance. The 1994 handbook was available on the FRA's website at the time of the East Palestine derailment but was not consulted during the lead-up to the vent and burn. The NTSB is concerned that the FRA's most recent and complete guidance about when to attempt the vent and burn method has not been widely disseminated to emergency responders. A vent and burn procedure was not necessary in East Palestine to prevent a BLEVE, but what was true in East Palestine may not hold in other circumstances or for other products. The NTSB concludes that the significant local and environmental impacts of a vent and burn decision demonstrate the need for federal guidance about what products and circumstances are candidates for the vent and burn method. The NTSB recommends that the FRA distribute the public versions of its 2007 vent and burn reports to



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emergency responder associations, including the IAFC, IAFF, and NVFC. To increase awareness of federal guidance, the NTSB recommends that the IAFC, IAFF, and NVFC advise their members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate.

While the 2007 reports contain useful guidance, they were developed before the East Palestine vent and burn and therefore do not incorporate lessons learned from that accident. The Phase II report does not advise an incident command to contact the shipper when considering a vent and burn, for example, instead directing the incident commander to a database that has not been widely distributed. The checklist provided in the Phase II report does not always clearly indicate how the answers to its questions should shape a vent and burn decision. For example, it includes a row for product viscosity (high, medium, or low) but does not clearly explain how an incident command can determine viscosities or how different viscosities will affect a vent and burn (FRA 2007a). The NTSB recommends that the FRA update and re-publish its 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re-published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. The NTSB also recommends that the FRA make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the IAFC, IAFF, and NVFC. The NTSB also recommends that PHMSA distribute the FRA's most current guidance on the vent and burn method to emergency response agencies by referencing it in the next edition of the ERG.

01/10/25

Addressee

Official Correspondence

74119

-From Amit Bose, Administrator: This letter responds to your July 12, 2024, letter detailing the 10 Safety Recommendations the National Transportation Safety Board (NTSB) made to the Federal Railroad Administration (FRA) in its accident investigation report RRD23MR005, Norfolk Southern Railway Derailment and Hazardous Materials Release; East Palestine, Ohio; February 3, 2023. NTSB sent a copy of that report to FRA on July 12, 2024.

In the "4. Recommendations" section of the report, NTSB issued to FRA Safety Recommendations R-24-02 through R-24-11, with Safety Recommendations R-24-02 through R-24-05 relating to hot bearing detectors (HBDs). Shortly after the East Palestine accident, FRA initiated a series of actions related to HBDs and wayside detectors in general. These actions, although initiated prior to NTSB's issuance of Recommendations R-24-02 through R-24-05, are relevant to those recommendations. Accordingly, FRA has included below a brief background section describing these actions. As FRA and NTSB representatives discussed on July 29, 2024, FRA has begun work to address the NTSB recommendations included in NTSB's July 12, 2024, letter, and a discussion of FRA's response to each recommendation is below.

Background on FRA's Activities Related to HBDs On March 3, 2023, in response to a series of rail accidents suspected of being caused by burnt journal bearings, including the East Palestine accident, FRA published Safety Advisory 2023-01 addressing the use and maintenance of HBDs. Footnote: 88 FR 13494 (Mar. 3, 2024).

<https://railroads.dot.gov/elibrary/safety-advisory-2023-01-evaluation-policies-and-procedures-related-use-and-maintenance-hot> Since publication of that Safety Advisory, FRA has continued to evaluate railroads' use of HBDs. On June 14, 2023, following another accident suspected of resulting from a burnt journal bearing, FRA issued a supplement to Safety Advisory 2023-01 with the additional recommendation that railroads take action to evaluate the resiliency and accuracy of the overall process used to monitor and measure bearing health. Footnote: 88 FR 38933 (June 14, 2023).

<https://www.federalregister.gov/documents/2023/06/14/2023-12724/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

On July 17, 2023, FRA issued a second supplement to Safety Advisory 2023-01 to reiterate and expand upon the recommendations in its previously published Safety Advisories related to HBDs. Footnote: 89 FR 58243 (July 17, 2024).

<https://www.federalregister.gov/documents/2024/07/17/2024-15691/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

The second supplement reiterates FRA's previous recommendations in Safety Advisory 2023-01 and its July 17, 2023, supplement, and expands on the recommendations to incorporate the findings of ongoing FRA evaluations, including the ongoing investigations into recent accidents suspected of being caused by burnt journals and the finalization of the evaluation of data collected in FRA's High-Hazard Flammable Train Route Assessment (HHFT Route Assessment).

Footnote: FRA conducted the HHFT Route Assessment in response to direction from Secretary of Transportation Pete Buttigieg. The



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assessment included a focused inspection and evaluation of routes in the national rail network over which the largest volumes of hazardous materials are transported. As part of that assessment, FRA conducted an initial investigation and evaluation of industry practices, processes, and procedures related to wayside detector technology

<https://railroads.dot.gov/elibrary/high-hazard-flammable-train-route-assessment-legacy-tank-car-focused-inspection-program>

Specifically, the second supplement emphasizes:

- The importance of trend analysis and the opportunity to integrate wayside detector data types to evaluate railcar health;
- The need to establish and follow appropriate processes in analyzing and responding to HBD data;
- The need for railroads to ensure that adequate staff are assigned to monitor and respond to wayside detector data; and
- The need for railroads to maximize the use of HBD data, including sharing wayside detector data between railroads, as a train travels from one railroad to another.

FRA is closely monitoring railroads' implementation of the recommendations in this Safety Advisory and its supplements. At the same time, FRA is supporting the activities of the Railroad Safety Advisory Committee (RSAC), which is tasked with considering and reviewing issues related to wayside detectors, and HBDs in particular. The current RSAC task and the intended output are described below in FRA's response to Safety Recommendation R-24-02.

FRA has initiated an update to amend and modernize the 2007 vent and burn reports. FRA is conducting this effort in two phases. Phase I will focus on: (1) reviewing and updating the list of commodities that are candidates for this mitigation technique and the chemical and other hazards that may result; (2) updating and expanding on tank car damage assessment and the critical elements that must be considered in determining if the vent and burn mitigation technique is a necessary recommendation to Incident Command; and (3) updating process flow charts based on lessons learned from East Palestine and other past incidents.

Phase II will focus on how a railroad's recommendation to use the vent and burn mitigation technique is then evaluated and processed by Incident Command. Stakeholders that will be involved in this phase will include the International Association of Fire Chiefs (IAFC), the International Association of Fire Fighters (IAFF), the National Volunteer Fire Council (NVFC), the Department of Homeland Security/Federal Emergency Management Agency (DHS/FEMA), the U.S. Environmental Protection Agency (EPA), and others as identified. Additional project details are still being developed, and this project is expected to start during first quarter FY-2025.

FRA believes this project will take approximately 18-24 months to complete. FRA requests that NTSB classify this recommendation as, "Open—Acceptable Response."

Once R-24-08 is complete, FRA will distribute and publish the updated vent and burn report(s). FRA requests that NTSB classify this recommendation as, "Open—Acceptable Response."



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                           |          |                        |                                  |          |
|---------------------------|----------|------------------------|----------------------------------|----------|
| <b>Recommendation # :</b> | R-24-010 | <b>Overall Status:</b> | Open - Initial Response Received | CLASS II |
|---------------------------|----------|------------------------|----------------------------------|----------|

TO THE FEDERAL RAILROAD ADMINISTRATION: Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. (Supersedes Safety Recommendation R-10-001)

|                         |   |                             |     |
|-------------------------|---|-----------------------------|-----|
| <b># of Addressees:</b> | 1 | <b>Overall Date Closed:</b> | N/A |
|-------------------------|---|-----------------------------|-----|

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| <b>Addressee:</b> | FRA | Open - Initial Response Received | <b>Date Closed:</b> | N/A |
|-------------------|-----|----------------------------------|---------------------|-----|

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|-----------------|------|--------------------|-------|
| <b>07/12/24</b> | NTSB | Transmittal Letter | 73264 |
|-----------------|------|--------------------|-------|

The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsbt.gov>.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, R-24-002 through R-24-011). We encourage you to submit your response to [ExecutiveSecretariat@ntsbt.gov](mailto:ExecutiveSecretariat@ntsbt.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

This letter provides information about the National Transportation Safety Board's (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsbt.gov>.

As a result of this investigation, we identified the following safety issues:



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- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Federal Railroad Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. (R-24-2) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors. (R-24-3) (See section 2.2.4.)
- Establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations. (R-24-4) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms. (R-24-5) (See section 2.2.4.)
- Monitor the progress of the Association of American Railroads' (AAR) action on R-24-20 and use your regulatory authority to ensure that the AAR addresses weaknesses in its tank car service equipment approval process. (R-24-6) (See section 2.4.3.1.)
- Distribute the public versions of your 2007 vent and burn reports to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-7) (See section 2.5.4.)
- Update and re publish your 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. (R-24-8) (See section 2.5.4.)
- Make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-9) (See section 2.5.4.)
- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. (R-24-10) (See section 2.6.)



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- Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. If necessary, obtain legislative authority to act on this recommendation. (R-24-11) (See section 2.6.)

In the same report, we also classified the following safety recommendations:

- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward and outward facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12 hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. (R 10 1)

Safety Recommendation R-10-1 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 10.

- Require that railroads regularly review and use in cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R 10 2)

Safety Recommendation R-10-2 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 11.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-2 through -11 and classified Safety Recommendations R-10-1 and -2). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 “Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023” published on July 12, 2024:

**2.6 Locomotive Data Recorders** The lead locomotive of train 32N was equipped with both head-end and inward-facing image recorders that provided investigators with video and audio data detailing the crew’s activities and actions in the moments leading up to and during the derailment. NS voluntarily installed these devices; image and audio recorders are not required by FRA regulations for freight locomotives. In this accident, the audio and video data demonstrated and confirmed that the crewmembers were alert and responded appropriately to the hot bearing alarm. Additionally, the data were instrumental in corroborating crew statements.

The NTSB has determined that many previous railroad accident investigations would have benefitted from this technology. In a number of these accidents, the operator was killed, seriously injured, or could not recall details moments before the accident. However, even in the cases where the operator was not injured, audio and image recorders could be used to help verify what might have been seen and what crew actions were taken during the accident sequence.

For example, audio and image recorders were beneficial to our investigation of the Amtrak passenger train 501 derailment in DuPont, Washington, on December 18, 2017 (NTSB 2019). In that accident, the locomotive was equipped with an inward-facing image recorder that provided both a visual and audio recording of the crewmember activities during the accident trip. The device was voluntarily installed, and the recorded information proved extremely useful in the NTSB investigation.

Further, image recordings were also beneficial to our investigations of the January 4, 2017, collision of two Southeastern Pennsylvania Transportation Authority trolleys in Philadelphia, Pennsylvania, and the April 3, 2016, Amtrak accident in Chester, Pennsylvania (NTSB 2018b, NTSB 2017c). In those accidents, as in East Palestine, investigators used the image recordings to gather additional pertinent information about the accident sequence and used the audio recordings to corroborate the statements made by the operating crews. In turn, this information was used to develop recommendations to improve the safety of train



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operations. These types of recorders are also critical to improving operational safety and management oversight.

Unfortunately, in many other railroad accidents, the NTSB has not been able to determine the actions of the crewmembers operating the train because of the lack of inward-facing image and audio recordings. In our investigation of the August 12, 2019, collision of two CSX Transportation freight trains near Carey, Ohio, the NTSB was unable to determine the actions of the westbound train's crewmembers when they were operating the train from Columbus, Ohio, to Carey, Ohio; the actions of the westbound train engineer operating alone in the locomotive cab; or the events leading up to the collision (NTSB 2020c). This collision again demonstrated the need for in-cab recording devices to better understand and thereby prevent serious railroad collisions.

Similar issues were found during the NTSB's investigation of the September 12, 2008, head-on collision in Chatsworth, California, between a Metrolink passenger train and a Union Pacific Railroad freight train (NTSB 2010). The NTSB was unable to determine the actions of the Metrolink engineer leading up to the collision, and after discovering some illicit activities by the train engineer during previous trips, the NTSB determined that Metrolink had no way of monitoring the train engineer's activities to ensure appropriate behavior.

The Chatsworth collision, in which 25 people were killed and 102 people were injured, underscored the importance of understanding the activities of crewmembers in the time leading up to the collision. As a result of that investigation, on February 23, 2010, the NTSB issued Safety Recommendations R-10-1 and R-10-2 to the FRA: Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash- and fire-protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. (R-10-1)159 Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R-10-2)160

In the 14 years since these recommendations were issued, the NTSB has reiterated them in the following seven major railroad accident investigations:

- September 30, 2010, collision of two Canadian National Railway freight trains near Two Harbors, Minnesota (NTSB 2013c)
- April 17, 2011, collision of a BNSF coal train with the rear end of a standing BNSF maintenance-of-way train in Red Oak, Iowa (NTSB 2012a)
- June 24, 2012, head-on collision of two Union Pacific Railroad freight trains near Goodwell, Oklahoma (NTSB 2013b)
- May 25, 2013, collision of a Union Pacific Railroad freight train with a BNSF Railway freight train near Chaffee, Missouri (NTSB 2014a)
- April 28, 2015, collision of two Southwestern Railroad freight trains near Roswell, New Mexico (NTSB 2018c)
- May 12, 2015, derailment of a National Railroad Passenger Corporation (Amtrak) passenger train in Philadelphia, Pennsylvania (NTSB 2016a)
- August 12, 2019, collision of two CSX Transportation freight trains near Carey, Ohio (NTSB 2020c)

Following the investigation of one of these accidents, the June 24, 2012, collision in Goodwell, Oklahoma, the NTSB made the following safety recommendation to all Class I railroads: Install in all controlling locomotive cabs and cab car operating compartments crash- and fire-protected inward- and outward-facing audio and image recorders. The devices should have a minimum 12-hour continuous recording capability. (R-13-26)

In response to Safety Recommendation R-13-26, on December 10, 2014, NS informed us that it already used outward-facing image recorders, and that it was analyzing safety benefits, costs, and employee privacy concerns related to inward-facing image recorders. On May 4, 2015, we noted these efforts and encouraged NS to install the recommended inward-facing audio and image recorders. Pending completion of that action, Safety Recommendation R-13-26 was classified Open—Acceptable Response. On December 23,



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2021, we followed up with NS on the status of implementation of the recommendation, but we have not yet received a reply. The lead locomotive involved in the East Palestine derailment was equipped with inward- and outward-facing image and audio recorders.

We issued R-13-26 to a total of seven Class I railroads. Of the remaining six Class I railroads, three have a status of Open—Acceptable Response, two have a status of Open—Unacceptable Response, and one has a status of Open—Await Response because the railroad has not yet responded. We are concerned that in over 10 years since we issued R-13-26, none of the Class I railroads has fully implemented this recommendation.

In response to Safety Recommendations R-10-1 and R-10-2, the FRA announced at a May 28, 2015, meeting of the Railroad Safety Advisory Committee that in the absence of Railroad Safety Advisory Committee consensus recommendations, the FRA was proceeding with an NPRM addressing mandatory installation of locomotive recording devices in both freight and passenger railroads. As a result, on September 29, 2015, Safety Recommendations R-10-1 and R-10-2 were classified Open—Acceptable Response.

The 2015 FAST Act required the Secretary of Transportation to promulgate, within 2 years after the date of the FAST Act, regulations to require each railroad carrier that provides regularly scheduled, intercity rail passenger or commuter rail passenger transportation to install inward- and outward-facing image recording devices in all controlling locomotive cabs and cab car operating compartments. However, the FRA did not develop regulations requiring that recording devices be installed in intercity rail passenger or commuter passenger transportation within the 2-year deadline. In our May 2019 DuPont accident report, the NTSB concluded that: The Federal Railroad Administration has demonstrated an unwillingness to implement the recommendations and regulation that would require inward-facing video and audio devices that are critical to accident investigations and improving safety on our nation's railroads. (NTSB 2019)

We further concluded that: Inward-facing recorders with both image and audio capabilities can increase the understanding of the circumstances of an accident, and, ultimately, provide greater precision in safety recommendations and subsequent safety improvements. Consequently, we issued the following recommendation to the Secretary of Transportation on June 21, 2019: Require the Federal Railroad Administration to issue regulations for inward-facing recorders that include image and audio recordings as recommended by the National Transportation Safety Board in R-10-1 and R-10-2. (R-19-7)

We have yet to receive a response from the Secretary of Transportation and the recommendation remains classified Open—Await Response. On July 24, 2019, 9 years after we issued R-10-1 and R-10-2 and more than a year and a half after the FAST Act required regulatory action, the FRA published an NPRM, titled "Locomotive Image and Audio Recording Devices for Passenger Trains," proposing a requirement to install inward- and outward-facing recorders in passenger trains (84 Fed. Reg. 35712). The NPRM was only partially responsive to the NTSB recommendations because it did not apply to freight railroads.

On September 16, 2019, the NTSB stated the following in response to the NPRM: Freight trains and passenger trains operate on the same railroad tracks, posing the risk of accidents that have the potential to significantly affect the public. From a safety management system perspective, it is probable that recorded information about safety problems identified in freight railroad accidents and incidents could inform, mitigate, or prevent similar safety problems that might potentially affect passenger railroad operations. As a result, we believe it would be shortsighted to limit the proposed rule to passenger railroads. The FRA should ensure one level of safety for both passenger and freight railroads. Further, we firmly believe any such devices that railroads have already voluntarily installed, whether on freight or passenger trains, should be required to meet the minimum standards in the final rule. Of the seven reiterations since we issued R-10-1 and R-10-2, six have involved collisions of freight trains.

In our 2020 Carey report, we concluded that "inward- and outward-facing recorders can improve the quality of accident and incident investigations and provide the opportunity for proactive steps by railroad management to verify that train crew actions are in accordance with safety rules and procedures" (NTSB 2020c). As a result, we reiterated Safety Recommendations R-10-1 and R-10-2 to the FRA. Because it had been 10 years since the recommendations were issued and the FRA had begun to address only passenger railroads, and not freight railroads, Safety Recommendations R-10-1 and R-10-2 were classified Open—Unacceptable Response.

On October 12, 2023, the FRA published the final rule, "Locomotive Image and Audio Recording Devices for Passenger Trains," amending 49 CFR Parts 217, 218, 229, and 299. The FRA rule requires installation of inward- and outward-facing locomotive image recording devices on all lead locomotives in passenger trains, as required by the FAST Act. The FRA declined to require freight railroads to install recording devices at the time of the rulemaking, saying the statutory requirements at 49 United States Code 20168(a) did not apply to freight locomotives (88 Fed. Reg. 70722). The rule falls short of our recommendations because it fails to



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require audio recording and excludes freight rail from any requirements. More than 14 years have passed since we recommended that the FRA require audio and image recorders in all locomotives, whether on freight or passenger trains. The recommendations were prompted by railroad accident investigations in which the NTSB determined having inward- and outward-facing audio and image recorders would have provided crucial information to the railroads, their workforces, the FRA, and the NTSB that could have improved safety. In a number of those accidents, the operator died, was seriously injured, or could not recall details from moments before the accident.

Inward- and outward-facing audio and image recorders that are crash- and fire-protected provide valuable information about the events leading up to and during an accident in determining why it occurred. In this case, inward-facing image and audio data were instrumental in eliminating the train crew's performance as a factor in the accident. Further, recorded image and audio information allows railroads, labor unions, the FRA, and the NTSB to identify and immediately address critical improvements that directly impact the safety of the rail industry, the traveling public, and the communities in which our railroads operate. The NTSB concludes that inward- and outward-facing recorders can improve the quality of accident and incident investigations and provide the opportunity for proactive steps by railroad management to verify that train crew actions are in accordance with safety rules and procedures. Therefore, the NTSB reiterates Safety Recommendation R-13-26 to the Class I railroads.

The NTSB believes that the FRA has the regulatory authority to establish regulations to act on Safety Recommendations R-10-1 and R-10-2. The relevant language in the FAST Act mandated that the FRA require image recorders for passenger and commuter trains but did not modify the FRA's existing authority to establish requirements for rail equipment, including image and audio recorders, to improve safety. However, we note that the FRA's rulemaking on image recorders resulted from a specific legislative mandate to act, and we believe that a legislative mandate to act on Safety Recommendations R-10-1 and R-10-2 would result in the FRA satisfying these long-standing recommendations. Therefore, the NTSB recommends that the FRA require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. The NTSB also recommends that the FRA require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. If necessary, obtain legislative authority to act on this recommendation. Safety Recommendations R-10-1 and R-10-2 are classified Closed—Superseded.

Finally, the NTSB concludes that the FRA's final rule in response to the FAST Act did not require audio recording in passenger locomotives and did not require inward- and outward-facing image and audio recording in freight rail locomotives, resulting in a missed opportunity to record important safety data. As noted above, the FAST Act did not directly mandate that the FRA establish regulations that would satisfy Safety Recommendations R-10-1 and R-10-2, and the FRA's October 2023 rulemaking did not address all the safety concerns raised by the NTSB. Therefore, the NTSB recommends that the Secretary of Transportation require the FRA to issue regulations for inward-facing recorders that include image and audio recordings as recommended by the NTSB in R-24-10 and R-24-11. If necessary, obtain legislative authority to act on this recommendation. Safety Recommendation R-19-7 is classified Closed—Superseded.

| 01/10/25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Addressee | Official Correspondence | 74119 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|-------|
| -From Amit Bose, Administrator: This letter responds to your July 12, 2024, letter detailing the 10 Safety Recommendations the National Transportation Safety Board (NTSB) made to the Federal Railroad Administration (FRA) in its accident investigation report RRD23MR005, Norfolk Southern Railway Derailment and Hazardous Materials Release; East Palestine, Ohio; February 3, 2023. NTSB sent a copy of that report to FRA on July 12, 2024.                                                                                                                                                                                                                                                                                                                                                                        |           |                         |       |
| In the "4. Recommendations" section of the report, NTSB issued to FRA Safety Recommendations R-24-02 through R-24-11, with Safety Recommendations R-24-02 through R-24-05 relating to hot bearing detectors (HBDs). Shortly after the East Palestine accident, FRA initiated a series of actions related to HBDs and wayside detectors in general. These actions, although initiated prior to NTSB's issuance of Recommendations R-24-02 through R-24-05, are relevant to those recommendations. Accordingly, FRA has included below a brief background section describing these actions. As FRA and NTSB representatives discussed on July 29, 2024, FRA has begun work to address the NTSB recommendations included in NTSB's July 12, 2024, letter, and a discussion of FRA's response to each recommendation is below. |           |                         |       |



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Background on FRA's Activities Related to HBDs On March 3, 2023, in response to a series of rail accidents suspected of being caused by burnt journal bearings, including the East Palestine accident, FRA published Safety Advisory 2023-01 addressing the use and maintenance of HBDs. Footnote: 88 FR 13494 (Mar. 3, 2024).

<https://railroads.dot.gov/elibrary/safety-advisory-2023-01-evaluation-policies-and-procedures-related-use-and-maintenance-hot> Since publication of that Safety Advisory, FRA has continued to evaluate railroads' use of HBDs. On June 14, 2023, following another accident suspected of resulting from a burnt journal bearing, FRA issued a supplement to Safety Advisory 2023-01 with the additional recommendation that railroads take action to evaluate the resiliency and accuracy of the overall process used to monitor and measure bearing health. Footnote: 88 FR 38933 (June 14, 2023).

<https://www.federalregister.gov/documents/2023/06/14/2023-12724/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

On July 17, 2023, FRA issued a second supplement to Safety Advisory 2023-01 to reiterate and expand upon the recommendations in its previously published Safety Advisories related to HBDs. Footnote: 89 FR 58243 (July 17, 2024).

<https://www.federalregister.gov/documents/2024/07/17/2024-15691/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

The second supplement reiterates FRA's previous recommendations in Safety Advisory 2023-01 and its July 17, 2023, supplement, and expands on the recommendations to incorporate the findings of ongoing FRA evaluations, including the ongoing investigations into recent accidents suspected of being caused by burnt journals and the finalization of the evaluation of data collected in FRA's High-Hazard Flammable Train Route Assessment (HHFT Route Assessment).

Footnote: FRA conducted the HHFT Route Assessment in response to direction from Secretary of Transportation Pete Buttigieg. The assessment included a focused inspection and evaluation of routes in the national rail network over which the largest volumes of hazardous materials are transported. As part of that assessment, FRA conducted an initial investigation and evaluation of industry practices, processes, and procedures related to wayside detector technology

<https://railroads.dot.gov/elibrary/high-hazard-flammable-train-route-assessment-legacy-tank-car-focused-inspection-program>

Specifically, the second supplement emphasizes:

- The importance of trend analysis and the opportunity to integrate wayside detector data types to evaluate railcar health;
- The need to establish and follow appropriate processes in analyzing and responding to HBD data;
- The need for railroads to ensure that adequate staff are assigned to monitor and respond to wayside detector data; and
- The need for railroads to maximize the use of HBD data, including sharing wayside detector data between railroads, as a train travels from one railroad to another.

FRA is closely monitoring railroads' implementation of the recommendations in this Safety Advisory and its supplements. At the same time, FRA is supporting the activities of the Railroad Safety Advisory Committee (RSAC), which is tasked with considering and reviewing issues related to wayside detectors, and HBDs in particular. The current RSAC task and the intended output are described below in FRA's response to Safety Recommendation R-24-02.

In October 2023, FRA issued a final rule on locomotive recording devices requiring the installation of inward- and outward-facing image recording devices on all lead locomotives in passenger trains.<sup>7</sup> FRA issued the final rule in response to the mandate of section 11411 of the Fixing America's Surface Transportation Act (FAST Act), which required FRA (as the delegate of the Secretary of Transportation) to issue regulations requiring railroads providing passenger service to install inward and outward-facing image recording devices in all controlling locomotives of passenger trains. The FAST Act left the issue of mandating audio recording devices in lead passenger train locomotives to FRA's discretion.

FRA considered requiring audio recording devices on both passenger and freight locomotives as well as requiring image recording devices on freight locomotives. While such requirements were not mandated by the FAST Act, FRA's general statutory authority (49 U.S.C. § 20103) provides the agency with the regulatory authority to do so. However, concerns regarding privacy, cost, and utility (e.g., how meaningful in-cab audio recordings would be given existing requirements for locomotive event recorders and the amount of information already communicated and recorded via radio) were raised regarding audio recorders in locomotives through the



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rulemaking process.

In addition, FRA considered whether the cost of installing inward and outward-facing image recording devices on freight locomotives outweighed the likely safety benefits that would be gained by the requirement, and took into account that, while many Class I railroads had already installed such recording devices or were in the process of doing so, very few Class II or III railroads have either inward- or outward-facing cameras installed in their locomotives, estimating only 1% of these short line railroads have inward-facing locomotive cameras.

FRA concluded that it was prudent to issue a rule responding directly to the statutory directive for image recording devices on passenger locomotives, and not include a requirement for such devices on freight locomotives or a requirement for audio recording devices on any locomotive. Nevertheless, as FRA noted in the final rule, FRA continues to monitor the freight industry's voluntary installation of locomotive recording devices and the effectiveness of those devices in freight rail operations.

Based on this continued monitoring and ongoing analysis of associated issues, FRA may take additional action in a separate proceeding to address the use of image recording devices on freight locomotives and audio recording devices on both passenger and freight locomotives.

While these activities are ongoing, FRA requests that NTSB classify this recommendation as, "Open—Acceptable Response."



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |                        |                                  |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                 | R-24-011 | <b>Overall Status:</b> | Open - Initial Response Received | CLASS II |
| TO THE FEDERAL RAILROAD ADMINISTRATION: Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. If necessary, obtain legislative authority to act on this recommendation. (Supersedes safety recommendation R-10-002) |          |                        |                                  |          |

|                         |   |                             |     |
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| <b># of Addressees:</b> | 1 | <b>Overall Date Closed:</b> | N/A |
|-------------------------|---|-----------------------------|-----|

|                   |     |                                  |                     |     |
|-------------------|-----|----------------------------------|---------------------|-----|
| <b>Addressee:</b> | FRA | Open - Initial Response Received | <b>Date Closed:</b> | N/A |
|-------------------|-----|----------------------------------|---------------------|-----|

|                 |      |                    |       |
|-----------------|------|--------------------|-------|
| <b>07/12/24</b> | NTSB | Transmittal Letter | 73264 |
|-----------------|------|--------------------|-------|

The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsbt.gov>.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, R-24-002 through R-24-011). We encourage you to submit your response to [ExecutiveSecretariat@ntsbt.gov](mailto:ExecutiveSecretariat@ntsbt.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

This letter provides information about the National Transportation Safety Board's (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsbt.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;



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- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Federal Railroad Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Research the effectiveness of current bearing defect detection systems, identify minimum standards to protect railroad personnel and the public, and make public the results of this research. (R-24-2) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish minimum requirements for bearing defect detection systems, including criteria for bearing alert and alarm thresholds and maximum distances between wayside detectors. (R-24-3) (See section 2.2.4.)
- Establish requirements for the installation, inspection, and maintenance of wayside bearing defect detectors to protect the reliability of these devices and improve the safety of railroad operations. (R-24-4) (See section 2.2.4.)
- Use the results of the research described in R-24-2 to develop and establish rules governing railroads' operational responses to bearing alerts and alarms. (R-24-5) (See section 2.2.4.)
- Monitor the progress of the Association of American Railroads' (AAR) action on R-24-20 and use your regulatory authority to ensure that the AAR addresses weaknesses in its tank car service equipment approval process. (R-24-6) (See section 2.4.3.1.)
- Distribute the public versions of your 2007 vent and burn reports to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-7) (See section 2.5.4.)
- Update and re publish your 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. (R-24-8) (See section 2.5.4.)
- Make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Volunteer Fire Council. (R-24-9) (See section 2.5.4.)
- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. (R-24-10) (See section 2.6.)
- Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are



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essential to safety. If necessary, obtain legislative authority to act on this recommendation. (R-24-11) (See section 2.6.)

In the same report, we also classified the following safety recommendations:

- Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward and outward facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12 hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. (R 10 1)

Safety Recommendation R-10-1 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 10.

- Require that railroads regularly review and use in cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R 10 2)

Safety Recommendation R-10-2 is classified Closed—Superseded in section 2.6 of the report. This recommendation is superseded by Safety Recommendation R 24 11.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-2 through -11 and classified Safety Recommendations R-10-1 and -2). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 “Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023” published on July 12, 2024:

**2.6 Locomotive Data Recorders** The lead locomotive of train 32N was equipped with both head-end and inward-facing image recorders that provided investigators with video and audio data detailing the crew’s activities and actions in the moments leading up to and during the derailment. NS voluntarily installed these devices; image and audio recorders are not required by FRA regulations for freight locomotives. In this accident, the audio and video data demonstrated and confirmed that the crewmembers were alert and responded appropriately to the hot bearing alarm. Additionally, the data were instrumental in corroborating crew statements.

The NTSB has determined that many previous railroad accident investigations would have benefitted from this technology. In a number of these accidents, the operator was killed, seriously injured, or could not recall details moments before the accident. However, even in the cases where the operator was not injured, audio and image recorders could be used to help verify what might have been seen and what crew actions were taken during the accident sequence.

For example, audio and image recorders were beneficial to our investigation of the Amtrak passenger train 501 derailment in DuPont, Washington, on December 18, 2017 (NTSB 2019). In that accident, the locomotive was equipped with an inward-facing image recorder that provided both a visual and audio recording of the crewmember activities during the accident trip. The device was voluntarily installed, and the recorded information proved extremely useful in the NTSB investigation.

Further, image recordings were also beneficial to our investigations of the January 4, 2017, collision of two Southeastern Pennsylvania Transportation Authority trolleys in Philadelphia, Pennsylvania, and the April 3, 2016, Amtrak accident in Chester, Pennsylvania (NTSB 2018b, NTSB 2017c). In those accidents, as in East Palestine, investigators used the image recordings to gather additional pertinent information about the accident sequence and used the audio recordings to corroborate the statements made by the operating crews. In turn, this information was used to develop recommendations to improve the safety of train operations. These types of recorders are also critical to improving operational safety and management oversight.

Unfortunately, in many other railroad accidents, the NTSB has not been able to determine the actions of the crewmembers operating



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the train because of the lack of inward-facing image and audio recordings. In our investigation of the August 12, 2019, collision of two CSX Transportation freight trains near Carey, Ohio, the NTSB was unable to determine the actions of the westbound train's crewmembers when they were operating the train from Columbus, Ohio, to Carey, Ohio; the actions of the westbound train engineer operating alone in the locomotive cab; or the events leading up to the collision (NTSB 2020c). This collision again demonstrated the need for in-cab recording devices to better understand and thereby prevent serious railroad collisions.

Similar issues were found during the NTSB's investigation of the September 12, 2008, head-on collision in Chatsworth, California, between a Metrolink passenger train and a Union Pacific Railroad freight train (NTSB 2010). The NTSB was unable to determine the actions of the Metrolink engineer leading up to the collision, and after discovering some illicit activities by the train engineer during previous trips, the NTSB determined that Metrolink had no way of monitoring the train engineer's activities to ensure appropriate behavior.

The Chatsworth collision, in which 25 people were killed and 102 people were injured, underscored the importance of understanding the activities of crewmembers in the time leading up to the collision. As a result of that investigation, on February 23, 2010, the NTSB issued Safety Recommendations R-10-1 and R-10-2 to the FRA: Require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash- and fire-protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. (R-10-1)159 Require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. (R-10-2)160

In the 14 years since these recommendations were issued, the NTSB has reiterated them in the following seven major railroad accident investigations:

- September 30, 2010, collision of two Canadian National Railway freight trains near Two Harbors, Minnesota (NTSB 2013c)
- April 17, 2011, collision of a BNSF coal train with the rear end of a standing BNSF maintenance-of-way train in Red Oak, Iowa (NTSB 2012a)
- June 24, 2012, head-on collision of two Union Pacific Railroad freight trains near Goodwell, Oklahoma (NTSB 2013b)
- May 25, 2013, collision of a Union Pacific Railroad freight train with a BNSF Railway freight train near Chaffee, Missouri (NTSB 2014a)
- April 28, 2015, collision of two Southwestern Railroad freight trains near Roswell, New Mexico (NTSB 2018c)
- May 12, 2015, derailment of a National Railroad Passenger Corporation (Amtrak) passenger train in Philadelphia, Pennsylvania (NTSB 2016a)
- August 12, 2019, collision of two CSX Transportation freight trains near Carey, Ohio (NTSB 2020c)

Following the investigation of one of these accidents, the June 24, 2012, collision in Goodwell, Oklahoma, the NTSB made the following safety recommendation to all Class I railroads: Install in all controlling locomotive cabs and cab car operating compartments crash- and fire-protected inward- and outward-facing audio and image recorders. The devices should have a minimum 12-hour continuous recording capability. (R-13-26)

In response to Safety Recommendation R-13-26, on December 10, 2014, NS informed us that it already used outward-facing image recorders, and that it was analyzing safety benefits, costs, and employee privacy concerns related to inward-facing image recorders. On May 4, 2015, we noted these efforts and encouraged NS to install the recommended inward-facing audio and image recorders. Pending completion of that action, Safety Recommendation R-13-26 was classified Open—Acceptable Response. On December 23, 2021, we followed up with NS on the status of implementation of the recommendation, but we have not yet received a reply. The lead locomotive involved in the East Palestine derailment was equipped with inward- and outward-facing image and audio recorders.



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We issued R-13-26 to a total of seven Class I railroads. Of the remaining six Class I railroads, three have a status of Open—Acceptable Response, two have a status of Open—Unacceptable Response, and one has a status of Open—Await Response because the railroad has not yet responded. We are concerned that in over 10 years since we issued R-13-26, none of the Class I railroads has fully implemented this recommendation.

In response to Safety Recommendations R-10-1 and R-10-2, the FRA announced at a May 28, 2015, meeting of the Railroad Safety Advisory Committee that in the absence of Railroad Safety Advisory Committee consensus recommendations, the FRA was proceeding with an NPRM addressing mandatory installation of locomotive recording devices in both freight and passenger railroads. As a result, on September 29, 2015, Safety Recommendations R-10-1 and R-10-2 were classified Open—Acceptable Response.

The 2015 FAST Act required the Secretary of Transportation to promulgate, within 2 years after the date of the FAST Act, regulations to require each railroad carrier that provides regularly scheduled, intercity rail passenger or commuter rail passenger transportation to install inward- and outward-facing image recording devices in all controlling locomotive cabs and cab car operating compartments. However, the FRA did not develop regulations requiring that recording devices be installed in intercity rail passenger or commuter passenger transportation within the 2-year deadline. In our May 2019 DuPont accident report, the NTSB concluded that: The Federal Railroad Administration has demonstrated an unwillingness to implement the recommendations and regulation that would require inward-facing video and audio devices that are critical to accident investigations and improving safety on our nation's railroads. (NTSB 2019)

We further concluded that: Inward-facing recorders with both image and audio capabilities can increase the understanding of the circumstances of an accident, and, ultimately, provide greater precision in safety recommendations and subsequent safety improvements. Consequently, we issued the following recommendation to the Secretary of Transportation on June 21, 2019: Require the Federal Railroad Administration to issue regulations for inward-facing recorders that include image and audio recordings as recommended by the National Transportation Safety Board in R-10-1 and R-10-2. (R-19-7)

We have yet to receive a response from the Secretary of Transportation and the recommendation remains classified Open—Await Response. On July 24, 2019, 9 years after we issued R-10-1 and R-10-2 and more than a year and a half after the FAST Act required regulatory action, the FRA published an NPRM, titled "Locomotive Image and Audio Recording Devices for Passenger Trains," proposing a requirement to install inward- and outward-facing recorders in passenger trains (84 Fed. Reg. 35712). The NPRM was only partially responsive to the NTSB recommendations because it did not apply to freight railroads.

On September 16, 2019, the NTSB stated the following in response to the NPRM: Freight trains and passenger trains operate on the same railroad tracks, posing the risk of accidents that have the potential to significantly affect the public. From a safety management system perspective, it is probable that recorded information about safety problems identified in freight railroad accidents and incidents could inform, mitigate, or prevent similar safety problems that might potentially affect passenger railroad operations. As a result, we believe it would be shortsighted to limit the proposed rule to passenger railroads. The FRA should ensure one level of safety for both passenger and freight railroads. Further, we firmly believe any such devices that railroads have already voluntarily installed, whether on freight or passenger trains, should be required to meet the minimum standards in the final rule. Of the seven reiterations since we issued R-10-1 and R-10-2, six have involved collisions of freight trains.

In our 2020 Carey report, we concluded that "inward- and outward-facing recorders can improve the quality of accident and incident investigations and provide the opportunity for proactive steps by railroad management to verify that train crew actions are in accordance with safety rules and procedures" (NTSB 2020c). As a result, we reiterated Safety Recommendations R-10-1 and R-10-2 to the FRA. Because it had been 10 years since the recommendations were issued and the FRA had begun to address only passenger railroads, and not freight railroads, Safety Recommendations R-10-1 and R-10-2 were classified Open—Unacceptable Response.

On October 12, 2023, the FRA published the final rule, "Locomotive Image and Audio Recording Devices for Passenger Trains," amending 49 CFR Parts 217, 218, 229, and 299. The FRA rule requires installation of inward- and outward-facing locomotive image recording devices on all lead locomotives in passenger trains, as required by the FAST Act. The FRA declined to require freight railroads to install recording devices at the time of the rulemaking, saying the statutory requirements at 49 United States Code 20168(a) did not apply to freight locomotives (88 Fed. Reg. 70722). The rule falls short of our recommendations because it fails to require audio recording and excludes freight rail from any requirements. More than 14 years have passed since we recommended that the FRA require audio and image recorders in all locomotives, whether on freight or passenger trains. The recommendations were prompted by railroad accident investigations in which the NTSB determined having inward- and outward-facing audio and image



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recorders would have provided crucial information to the railroads, their workforces, the FRA, and the NTSB that could have improved safety. In a number of those accidents, the operator died, was seriously injured, or could not recall details from moments before the accident.

Inward- and outward-facing audio and image recorders that are crash- and fire-protected provide valuable information about the events leading up to and during an accident in determining why it occurred. In this case, inward-facing image and audio data were instrumental in eliminating the train crew's performance as a factor in the accident. Further, recorded image and audio information allows railroads, labor unions, the FRA, and the NTSB to identify and immediately address critical improvements that directly impact the safety of the rail industry, the traveling public, and the communities in which our railroads operate. The NTSB concludes that inward- and outward-facing recorders can improve the quality of accident and incident investigations and provide the opportunity for proactive steps by railroad management to verify that train crew actions are in accordance with safety rules and procedures. Therefore, the NTSB reiterates Safety Recommendation R-13-26 to the Class I railroads.

The NTSB believes that the FRA has the regulatory authority to establish regulations to act on Safety Recommendations R-10-1 and R-10-2. The relevant language in the FAST Act mandated that the FRA require image recorders for passenger and commuter trains but did not modify the FRA's existing authority to establish requirements for rail equipment, including image and audio recorders, to improve safety. However, we note that the FRA's rulemaking on image recorders resulted from a specific legislative mandate to act, and we believe that a legislative mandate to act on Safety Recommendations R-10-1 and R-10-2 would result in the FRA satisfying these long-standing recommendations. Therefore, the NTSB recommends that the FRA require the installation, in all controlling locomotive cabs and cab car operating compartments, of crash and fire protected inward- and outward-facing audio and image recorders capable of providing recordings to verify that train crew actions are in accordance with rules and procedures that are essential to safety as well as train conditions. The devices should have a minimum 12-hour continuous recording capability with recordings that are easily accessible for review, with appropriate limitations on public release, for the investigation of accidents or for use by management in carrying out efficiency testing and systemwide performance monitoring programs. If necessary, obtain legislative authority to act on this recommendation. The NTSB also recommends that the FRA require that railroads regularly review and use in-cab audio and image recordings (with appropriate limitations on public release), in conjunction with other performance data, to verify that train crew actions are in accordance with rules and procedures that are essential to safety. If necessary, obtain legislative authority to act on this recommendation. Safety Recommendations R-10-1 and R-10-2 are classified Closed—Superseded.

Finally, the NTSB concludes that the FRA's final rule in response to the FAST Act did not require audio recording in passenger locomotives and did not require inward- and outward-facing image and audio recording in freight rail locomotives, resulting in a missed opportunity to record important safety data. As noted above, the FAST Act did not directly mandate that the FRA establish regulations that would satisfy Safety Recommendations R-10-1 and R-10-2, and the FRA's October 2023 rulemaking did not address all the safety concerns raised by the NTSB. Therefore, the NTSB recommends that the Secretary of Transportation require the FRA to issue regulations for inward-facing recorders that include image and audio recordings as recommended by the NTSB in R-24-10 and R-24-11. If necessary, obtain legislative authority to act on this recommendation. Safety Recommendation R-19-7 is classified Closed—Superseded.

| 01/10/25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Addressee | Official Correspondence | 74119 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|-------|
| -From Amit Bose, Administrator: This letter responds to your July 12, 2024, letter detailing the 10 Safety Recommendations the National Transportation Safety Board (NTSB) made to the Federal Railroad Administration (FRA) in its accident investigation report RRD23MR005, Norfolk Southern Railway Derailment and Hazardous Materials Release; East Palestine, Ohio; February 3, 2023. NTSB sent a copy of that report to FRA on July 12, 2024.                                                                                                                                                                                                                                                                                                                                                                        |           |                         |       |
| In the "4. Recommendations" section of the report, NTSB issued to FRA Safety Recommendations R-24-02 through R-24-11, with Safety Recommendations R-24-02 through R-24-05 relating to hot bearing detectors (HBDs). Shortly after the East Palestine accident, FRA initiated a series of actions related to HBDs and wayside detectors in general. These actions, although initiated prior to NTSB's issuance of Recommendations R-24-02 through R-24-05, are relevant to those recommendations. Accordingly, FRA has included below a brief background section describing these actions. As FRA and NTSB representatives discussed on July 29, 2024, FRA has begun work to address the NTSB recommendations included in NTSB's July 12, 2024, letter, and a discussion of FRA's response to each recommendation is below. |           |                         |       |
| Background on FRA's Activities Related to HBDs On March 3, 2023, in response to a series of rail accidents suspected of being caused by burnt journal bearings, including the East Palestine accident, FRA published Safety Advisory 2023-01 addressing the use and maintenance of HBDs. Footnote: 88 FR 13494 (Mar. 3, 2024).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |                         |       |



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<https://railroads.dot.gov/elibrary/safety-advisory-2023-01-evaluation-policies-and-procedures-related-use-and-maintenance-hot>  
Since publication of that Safety Advisory, FRA has continued to evaluate railroads' use of HBDs. On June 14, 2023, following another accident suspected of resulting from a burnt journal bearing, FRA issued a supplement to Safety Advisory 2023-01 with the additional recommendation that railroads take action to evaluate the resiliency and accuracy of the overall process used to monitor and measure bearing health. Footnote: 88 FR 38933 (June 14, 2023).

<https://www.federalregister.gov/documents/2023/06/14/2023-12724/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

On July 17, 2023, FRA issued a second supplement to Safety Advisory 2023-01 to reiterate and expand upon the recommendations in its previously published Safety Advisories related to HBDs. Footnote: 89 FR 58243 (July 17, 2024).

<https://www.federalregister.gov/documents/2024/07/17/2024-15691/safety-advisory-2023-01-evaluation-of-policies-and-procedures-related-to-the-use-and-maintenance-of>

The second supplement reiterates FRA's previous recommendations in Safety Advisory 2023-01 and its July 17, 2023, supplement, and expands on the recommendations to incorporate the findings of ongoing FRA evaluations, including the ongoing investigations into recent accidents suspected of being caused by burnt journals and the finalization of the evaluation of data collected in FRA's High-Hazard Flammable Train Route Assessment (HHFT Route Assessment).

Footnote: FRA conducted the HHFT Route Assessment in response to direction from Secretary of Transportation Pete Buttigieg. The assessment included a focused inspection and evaluation of routes in the national rail network over which the largest volumes of hazardous materials are transported. As part of that assessment, FRA conducted an initial investigation and evaluation of industry practices, processes, and procedures related to wayside detector technology

<https://railroads.dot.gov/elibrary/high-hazard-flammable-train-route-assessment-legacy-tank-car-focused-inspection-program>

Specifically, the second supplement emphasizes:

- The importance of trend analysis and the opportunity to integrate wayside detector data types to evaluate railcar health;
- The need to establish and follow appropriate processes in analyzing and responding to HBD data;
- The need for railroads to ensure that adequate staff are assigned to monitor and respond to wayside detector data; and
- The need for railroads to maximize the use of HBD data, including sharing wayside detector data between railroads, as a train travels from one railroad to another.

FRA is closely monitoring railroads' implementation of the recommendations in this Safety Advisory and its supplements. At the same time, FRA is supporting the activities of the Railroad Safety Advisory Committee (RSAC), which is tasked with considering and reviewing issues related to wayside detectors, and HBDs in particular. The current RSAC task and the intended output are described below in FRA's response to Safety Recommendation R-24-02.

Section 11411 of the FAST Act explicitly stated that a railroad required to install inward or outward-facing image recording devices "may" use the recordings from that device for purposes of "[v]erifying that train crew actions are in accordance with applicable safety laws, and the railroad carrier's operating rules and procedures." Consistent with that mandate, the locomotive recording devices final rule provides passenger railroads with the discretion to use the recording devices in carrying out their operational testing and inspection programs under 49 CFR part 217 (Part 217 Programs) subject to requirements that serve to protect employees from targeted testing and other misuse. Further, the final rule made clear FRA expects that all railroads, including freight railroads, that voluntarily install recording devices on their locomotives will adhere to practices consistent with the final rule, including the new employee safeguards the rule requires for Part 217 Programs.

To date, all Class I freight railroads have incorporated the use of image recording devices into their Part 217 Programs. Through FRA's ongoing Safety Culture Assessment process and other regulatory audits, FRA is evaluating railroads' compliance with these existing operational testing and inspection requirements. Based on the audits' findings and other oversight activity, FRA will consider whether mandating the use of recording devices for Part 217 Programs is justified given that Section 11411 left it to a railroad's discretion whether to use locomotive recording devices for operational testing purposes. While these activities are ongoing, FRA requests that NTSB classify this recommendation as, "Open—Acceptable Response."



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Improving railroad safety is FRA's top priority, and we will continue to work to make rail operations as safe as possible. FRA is committed to working with NTSB to prevent future accidents and save lives. FRA will consider all recommendations to further that goal.

If FRA can provide further information or assistance, please contact Mr. Karl Alexy, Associate Administrator for Railroad Safety and Chief Safety Officer.



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |          |                                  |                                  |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | R-24-012 | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Obtain the necessary legislative authority and accelerate the deadline for removing specification DOT 111 tank cars from flammable liquids service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1        |                                  | <b>Overall Date Closed:</b>      | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | PHMSA    | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |
| <b>07/12/24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | NTSB     | Transmittal Letter               | 73264                            |          |
| The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbgov">http://www.ntsbgov</a> .                                                                                                                                                                                                                                                                                                                                                                                       |          |                                  |                                  |          |
| The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, I-24-001, R-24-012 through R-24-015). We encourage you to submit your response to <a href="mailto:ExecutiveSecretariat@ntsb.gov">ExecutiveSecretariat@ntsb.gov</a> . If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response. |          |                                  |                                  |          |
| This letter provides information about the National Transportation Safety Board's (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbgov">http://www.ntsbgov</a> .                                                                                                                                                                                                                                                                                                                                               |          |                                  |                                  |          |
| As a result of this investigation, we identified the following safety issues:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |                                  |                                  |          |
| <ul style="list-style-type: none"><li>• Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;</li><li>• Inadequate emergency response training for volunteer first responders;</li><li>• Delayed transmittal of train consist information necessary to protect first responders and the public;</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                              |          |                                  |                                  |          |



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- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Pipeline and Hazardous Materials Safety Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Require that placards be able to survive fires and accidents and remain legible during such emergencies long enough to fulfill their functions as described in the Emergency Response Guidebook. (I 24 1) (See section 2.3.3.)
- Obtain the necessary legislative authority and accelerate the deadline for removing specification DOT 111 tank cars from flammable liquids service. (R-24-12) (See section 2.4.2.)
- Establish a tank car replacement schedule whereby non-pressure tank cars in any hazardous materials service must meet or exceed the safety standards of the DOT-117 specification; if necessary, obtain legislative authority to act on this recommendation. (R-24-13) (See section 2.4.2.)
- Revise the definition of high hazard flammable train to account for differences in survivability between tank car specifications and to include hazardous materials other than flammable liquids, such as combustible liquids and Division 2.1 flammable gases, that can contribute to cascading hazardous materials releases; if necessary, obtain legislative authority to act on this recommendation. (R-24-14.) (See section 2.4.4.)
- Distribute the Federal Railroad Administration's most current guidance on the vent and burn method to emergency response agencies by referencing it in the next edition of the Emergency Response Guidebook (R-24-15) (See section 2.5.4.)

In the same report, we also classified the following safety recommendation:

- With the assistance of the Federal Railroad Administration, require that railroads immediately provide to emergency responders accurate, real time information regarding the identity and location of all hazardous materials on a train. (R 07 4)
- Safety Recommendation R-07-4 is classified Closed—Acceptable Action in section 2.3.2 of this report.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendation I-24-1, Safety Recommendations R-24-12 through -15, and classified Safety Recommendation R 07 4). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.4.2 Non-Pressure Tank Cars

### 2.4.2.1 DOT-111 Derailment Performance at East Palestine

The DOT-111 and DOT-117 specifications are both non-pressure tank cars in widespread hazardous materials service, and the East



Palestine derailment involved both specifications. Postderailment examination of the seven mechanically breached DOT-111 tank cars found that five sustained cracks or punctures in tank heads. This type of damage is consistent with impacts to the tank heads, usually between adjacent railcars as railcars' kinetic energy causes them to collide end-to-end (run-in) and leave the track (create a pileup) during a derailment. This indicates that the single most common failure mode for DOT-111 tank cars in East Palestine was tank head protection insufficient to preserve tank integrity. The DOT-117 tank cars subjected to the same derailment were equipped with full-height head shields and remained mechanically intact, underscoring the greater relative vulnerability of the DOT-111 tank cars to mechanical breaches.

#### 2.4.2.2 Past DOT-111 Derailment Performance and Regulatory Action

The DOT-111 specification's vulnerability to breaches during derailments is a well-documented issue. The NTSB calculated release rates for DOT-111 tank cars in a 1991 safety study titled *Transport of Hazardous Materials by Rail*. The studied period extended from March 1988 through February 1989 and included 45 rail accidents involving 149 tank cars. The study found that 54% of DOT-111 tank cars involved in accidents in 1988–1989 released lading, and that head and shell punctures accounted for 22% of releases (NTSB 1991). The NTSB observed a similar breach rate at East Palestine: the mechanical and thermal crashworthiness performance of DOT-111 tank cars in East Palestine represents a breach rate of 50% (8 of 16 derailed DOT-111s released lading), and a breach rate of 44% from confirmed mechanical damage.

Hazardous materials releases from DOT-111 tank cars have led to several investigations, safety recommendations, and regulatory actions. On June 19, 2009, Canadian National Railway Company ethanol unit train U70691-18 derailed in Cherry Valley, Illinois (NTSB 2012b). Of the 19 DOT-111 tank cars that derailed, 13 were breached and caught fire, resulting in the release of about 324,000 gallons of ethanol. The postderailment fire resulted in one death, nine injuries, and the evacuation of 600 homes within half a mile of the accident. The NTSB found that the inadequate design of the DOT-111 tank cars contributed to the severity of the accident. The NTSB determined that if enhanced tank head and shell puncture-resistance systems such as head shields, tank jackets, and increased shell thicknesses had been features of the DOT-111 tank cars involved in this accident, the release of hazardous materials likely would have been significantly reduced.

As a result of our investigation of the Cherry Valley derailment and fire, the NTSB issued the following safety recommendations to PHMSA: Require that all newly manufactured and existing general service tank cars authorized for transportation of denatured fuel ethanol and crude oil in Packing Groups I and II have enhanced tank head and shell puncture-resistance systems and top fittings protection that exceeds existing design requirements for DOT-111 tank cars. (R-12-5)<sup>136</sup> Require that all bottom outlet valves used on newly manufactured and existing non-pressure tank cars are designed to remain closed during accidents in which the valve and operating handle are subjected to impact forces. (R-12-6)<sup>137</sup>

The NTSB classified Safety Recommendations R-12-5 and R-12-6 Closed—Acceptable Action on July 12, 2016, after PHMSA's adoption of final rule HM-251, which established the DOT-117 specification and required that tank cars in Class 3 flammable liquids service meet the associated standards if used in HHFTs. The DOT-117 specification included the protective features described in the safety recommendations, and we noted in our letter to PHMSA that we commended the decision to require the DOT-117 specification for all Class 3 flammable liquids being transported in HHFTs, not only ethanol and crude oil.

On July 5, 2013, a Montreal Maine and Atlantic freight train with 72 DOT-111 tank cars carrying petroleum crude oil derailed in Lac-Mégantic Quebec, Canada (TSB 2014b).<sup>138</sup> Following a crew change, the train was left unattended on the mainline track. The train began to move uncontrolled on a descending grade, derailling 63 tank cars that released 1.6 million gallons of crude oil that ignited and killed 47 people.

The NTSB issued safety recommendations derived from its participation in the Transportation Safety Board of Canada's (TSB) investigation. Because the Cherry Valley recommendations regarding DOT-111 were recent and still open, our recommendations following Lac-Mégantic addressed safety issues other than the low survivability of DOT-111 tank cars. However, in safety recommendation letters addressed to PHMSA and the FRA, the NTSB noted the potential destructive effects of large numbers of derailed DOT-111 tank cars containing flammable materials and referenced other relevant NTSB investigations, including:

- The July 11, 2012, NS train derailment in a Columbus, Ohio, industrial area, in which three derailed DOT-111 tank cars released about 53,000 gallons of ethanol, with energetic rupture of one tank car in a postderailment fire (NTSB 2014b).
- The October 7, 2011, derailment of an Iowa Interstate Railroad train in Tiskilwa, Illinois, of 10 DOT-111 tank cars, resulting in fire,



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energetic rupture of several tank cars, and the release of 162,000 gallons of ethanol (NTSB 2013a).

- The October 20, 2006, NS ethanol unit train derailment in New Brighton, Pennsylvania, in which 23 DOT-111 tank cars derailed, fell from a bridge, caught fire, and released more than 485,000 gallons of ethanol (NTSB 2008).

On December 30, 2013, a westbound BNSF Railway train derailed 13 railcars transporting grain in Casselton, North Dakota, fouling the adjacent main track (NTSB 2017d). An eastbound BNSF Railway train with 104 tank cars loaded with petroleum crude oil struck a derailed railcar. The collision derailed 20 DOT-111 tank cars from the eastbound train; 18 tank cars were breached and released about 476,000 gallons of crude oil that subsequently caught fire. DOT-111 tank cars that released lading included 13 with torn or punctured heads and shells, 3 with thermal tears, 10 with damaged valves and fittings, and 3 that released product from BOVs. The investigation noted that the release was made more severe by the pooling of a flammable liquid that caught fire and caused additional tank cars to fail.

The NTSB adopted its report for Casselton on February 7, 2017, and released it on March 9, 2017, but because another NTSB derailment investigation involving DOT-111 tank cars led to urgent recommendations before the Casselton investigation was complete, the Casselton report classified existing safety recommendations relevant to the DOT-111 specification instead of issuing new ones. This additional investigation concerned the February 16, 2015, derailment of 27 loaded DOT-111 tank cars from a CSX Transportation crude oil unit train in Mount Carbon, West Virginia.<sup>139</sup> The tank cars were constructed to the CPC-1232 standard, but none had thermal protection. During the derailment, two tank cars were punctured and released more than 50,000 gallons of crude oil. Nineteen tank cars became involved in a postderailment pool fire that caused thermal tank shell failures on 13 tank cars that had otherwise survived the derailment. During our investigation, the NTSB collected information about three additional derailments in which 15 other CPC-1232 thermally failed and released thousands of gallons of flammable crude oil.<sup>140</sup>

The NTSB noted that the DOT-111 tank cars (including those manufactured to the CPC-1232 standard) were not required to be equipped with thermal protection systems to protect the tank from exposure to pool or torch fire conditions. In our recommendation letter to PHMSA, the NTSB concluded: The thermal performance and pressure relief capacity of bare steel tank cars that conform to current federal and industry requirements is insufficient to prevent tank failures from pool fire thermal exposure and the resulting overpressurization.

As the result of our investigation, the NTSB issued urgent safety recommendations to PHMSA: Require that all new and existing tank cars used to transport all Class 3 flammable liquids be equipped with thermal protection systems that meet or exceed the thermal performance standards outlined in Title 49 Code of Federal Regulations 179.18(a) and are appropriately qualified for the tank car configuration and the commodity transported. (R-15-14, Urgent)<sup>141</sup> In conjunction with thermal protection systems called for in safety recommendation R-15-14, require that all new and existing tank cars used to transport all Class 3 flammable liquids be equipped with appropriately sized pressure relief devices that allow the release of pressure under fire conditions to ensure thermal performance that meets or exceeds the requirements of Title 49 Code of Federal Regulations 179.18(a), and that minimizes the likelihood of energetic thermal ruptures. (R-15-15, Urgent)<sup>142</sup> Require an aggressive, intermediate progress milestone schedule, such as a 20 percent yearly completion metric over a 5-year implementation period, for the replacement or retrofitting of legacy DOT-111 and CPC-1232 tank cars to appropriate tank car performance standards, that includes equipping these tank cars with jackets, thermal protection, and appropriately sized pressure relief devices. (R-15-16, Urgent)

PHMSA published final rule HM-251 before publication of the NTSB's report on the Casselton derailment. Final rule HM-251 created the DOT-117 specification, which includes thermal performance standards, and required the specification's use in HHFTs. However, as the NTSB noted in its letter to PHMSA on July 12, 2016, the final rule did not require thermal protection systems or PRDs on all tank cars in Class 3 flammable liquids service—only tank cars used in HHFTs. Because PHMSA was still drafting regulations associated with the passage of the FAST Act, the NTSB classified Safety Recommendations R-15-14 and R-15-15 Open—Acceptable Response. On August 15, 2016, after passage of the FAST Act, PHMSA issued final rule HM-251C, establishing a phase-out schedule for all tank cars in Class 3 flammable liquids service, including tank cars in non-HHFT trains. The NTSB classified Safety Recommendations R-15-14 and R-15-15 Closed—Acceptable Action in our report on the Casselton derailment (NTSB 2017d). We noted in our March 3, 2017, letter to PHMSA that:

The FAST Act kept an implementation schedule for continued use of tank cars in crude oil and ethanol service similar to that provided in [PHMSA final rule HM-251], requiring full DOT-117 compliance by May 1, 2025. However, the FAST Act also requires retrofitting or removing from service tank cars transporting other Class 3 flammable liquids in Packing Group I by May 1, 2025, and in Packing Groups II and III by May 1, 2029.



This phase-out timeline is current as of the date of this report. The FAST Act phase-out mandates do not provide the Secretary of Transportation the discretion to change the compliance dates. In Safety Recommendation R-15-16, the NTSB advocated for a more aggressive phase-out date but recognized that the congressional mandate had overtaken PHMSA's ability to implement the recommended action. Therefore, on February 11, 2020, the NTSB classified Safety Recommendation R-15-16 Closed—No Longer Applicable.

While the eventual phase out of DOT-111 tank cars from flammable liquids service is a positive step, the NTSB is concerned by the current timeline for replacing DOT-111 tank cars with the superior DOT-117 specification. The history of accidents involving DOT-111 tank cars highlights their poor mechanical and thermal survivability, but the FAST Act phase out will leave some DOT-111 tank cars in flammable liquids service until 2029—including the specific combination of DOT-111 tank car and lading that failed and contributed to other hazardous materials releases at East Palestine. Tank car UTLX205907 released flammable liquid (butyl acrylates) through a head-end puncture, a failure mode that the DOT-117 specification, with its required head shield, is specifically designed to prevent. It is likely that if tank car UTLX205907 had met the DOT-117 specification, the consequences of the East Palestine derailment would have been much less severe.

The NTSB has identified other accidents in which the greater vulnerability of the DOT-111 relative to the DOT-117 and other authorized tank car specifications likely contributed to the severity of a hazardous materials release. From 2013 through 2023, the NTSB investigated 17 accidents in which damaged DOT-111 and CPC-1232 tank cars released hazardous materials. (See table 17.) In 15 of these accidents (88%), the hazardous materials release likely would have been prevented or reduced by the use of a more robust tank car specification, such as the DOT-117, with a thicker tank shell, thermal protection, and consistent use of full-height head shields.

#### 2.4.2.3 Acceleration of DOT-111 Tank Car Phase Out

The DOT-111 specification's known poor derailment performance warrants removing the specification from hazardous materials service as quickly as possible. Although its ability to accelerate the phase out of DOT-111 tank cars is curtailed by the FAST Act, PHMSA has acknowledged the safety benefits of an expedited replacement or retrofit schedule. In response to the East Palestine derailment, PHMSA urged companies that own and use DOT-111 tank cars in flammable liquids service to consider replacing them with DOT-117 or DOT-117R specification tank cars as soon as practicable in the interest of public safety (PHMSA 2023b). As stated in its March 22, 2023, safety advisory, PHMSA believes it is possible for tank car owners and the shipping industry to acquire enough DOT-117 tank cars for flammable liquids service well before the May 1, 2029, phase-out date mandated by the FAST Act (PHMSA 2023b). PHMSA also expressed confidence that this can be accomplished with existing shop capacity. Similarly, the FRA's January 2024 report on its Legacy Tank Car Focused Inspection Program noted that the Railway Supply Institute has previously indicated that it may be technically and operationally feasible to accelerate the May 2029 DOT-111 phase-out deadline by 1 year (FRA 2024).

However, the DOT-111 specification continues in widespread flammable liquids service. According to the AAR, there were almost 26,600 DOT-117 tank cars and about 6,700 pressure tank cars (DOT-105 and DOT-112 specifications, which exceed the DOT-117 requirements) used to transport flammable liquids other than crude oil and ethanol in 2023, while about 25,300 DOT-111 and CPC-1232 tank cars are still in use for other flammable liquids (AAR 2024b). In other words, about 43% of tank cars transporting flammable liquids other than crude oil and ethanol still did not meet the DOT-117 specification in 2023. Further, the 2024 FRA report found that while some tank car owners are on track to meet the May 2029 phase-out deadline, economic factors create disincentives for a faster phase out (FRA 2024). The NTSB concludes that voluntary industry action to improve the safety of the tank car fleet by completing the phase out of remaining DOT-111 tank cars in flammable liquids service ahead of the FAST Act mandate is feasible, but such action is unlikely because of economic and business disincentives. As of the date of this report, congressional action has been proposed to accelerate the phase out of certain tank cars, including the DOT-111 specification, from flammable liquids service by May 1, 2025, 4 years sooner than required under the FAST Act.<sup>144</sup> The NTSB recommends that PHMSA obtain the necessary legislative authority and accelerate the deadline for removing specification DOT-111 tank cars from flammable liquids service.

#### 2.4.2.4 Non-pressure Tank Cars in Other Hazardous Materials Service

The NTSB is concerned by continued use of DOT-111 and similar tank cars in hazardous materials service partially because hazardous materials releases can cascade: the failure of one tank car can fuel a fire, which can lead other tank cars to release lading. In East Palestine, DOT-111 tank cars carrying flammable and combustible liquids likely contributed to fires that caused hazardous materials releases from PRDs fitted to pressure tank cars—pressure tank cars that remained intact during the derailment and



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otherwise would have retained lading. The East Palestine derailment demonstrates that hazardous materials tank cars with relatively poor derailment survivability can adversely affect the lading retention of more resilient tank cars, such as DOT-105 tank cars. The NTSB concludes that the presence of DOT-111 tank cars carrying hazardous materials in a mixed freight train increases the risk of lading releases from other, more resilient tank cars during a derailment.

The FAST Act does not require non-pressure tanks used to transport combustible or other non-flammable hazardous materials to meet the DOT-117 specification. This means there is no phase-out schedule for DOT-111, AAR-211, or CPC-1232 tank cars in other than flammable liquids service (such as combustible or other non-flammable hazardous materials). Of the three DOT-111 tank cars that released hazardous materials during the East Palestine derailment, two were transporting combustible liquids and therefore were not subject to the FAST Act. Therefore, the NTSB recommends that PHMSA establish a tank car replacement schedule whereby non-pressure tank cars in any hazardous materials service must meet or exceed the safety standards of the DOT-117 specification; if necessary, obtain legislative authority to act on this recommendation.

| 10/11/24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Addressee | Official Correspondence | 73823 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|-------|
| -From Tristan H. Brown, Deputy Administrator: PHMSA concurs with NTSB's SR to seek legislative authority to accelerate the deadline for removing specification DOT-111 tank cars from flammable liquid service. The current phase out schedule for DOT-111 tank cars in flammable liquid service was mandated by the Fixing America's Surface Transportation (FAST) Act of 2015. Changing this mandate will require legislative action. In February of 2023, the Secretary of Transportation called on Congress to address this issue legislatively, and since then, PHMSA has been actively working with Congress to provide technical assistance on legislation that would revise the phase out deadline and is prepared to take steps in accordance with any change. |           |                         |       |



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |                                  |                                  |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | R-24-013 | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Establish a tank car replacement schedule whereby non-pressure tank cars in any hazardous materials service must meet or exceed the safety standards of the DOT-117 specification; if necessary, obtain legislative authority to act on this recommendation.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1        |                                  | <b>Overall Date Closed:</b>      | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | PHMSA    | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |
| <b>07/12/24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | NTSB     | Transmittal Letter               | 73264                            |          |
| The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbt.gov">http://www.ntsbt.gov</a> .                                                                                                                                                                                                                                                                                                                                                                                     |          |                                  |                                  |          |
| The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, I-24-001, R-24-012 through R-24-015). We encourage you to submit your response to <a href="mailto:ExecutiveSecretariat@ntsbt.gov">ExecutiveSecretariat@ntsbt.gov</a> . If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response. |          |                                  |                                  |          |
| This letter provides information about the National Transportation Safety Board's (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbt.gov">http://www.ntsbt.gov</a> .                                                                                                                                                                                                                                                                                                                                             |          |                                  |                                  |          |
| As a result of this investigation, we identified the following safety issues:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |          |                                  |                                  |          |
| <ul style="list-style-type: none"><li>• Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;</li><li>• Inadequate emergency response training for volunteer first responders;</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |                                  |                                  |          |



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- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Pipeline and Hazardous Materials Safety Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Require that placards be able to survive fires and accidents and remain legible during such emergencies long enough to fulfill their functions as described in the Emergency Response Guidebook. (I 24 1) (See section 2.3.3.)
- Obtain the necessary legislative authority and accelerate the deadline for removing specification DOT 111 tank cars from flammable liquids service. (R-24-12) (See section 2.4.2.)
- Establish a tank car replacement schedule whereby non-pressure tank cars in any hazardous materials service must meet or exceed the safety standards of the DOT-117 specification; if necessary, obtain legislative authority to act on this recommendation. (R-24-13) (See section 2.4.2.)
- Revise the definition of high hazard flammable train to account for differences in survivability between tank car specifications and to include hazardous materials other than flammable liquids, such as combustible liquids and Division 2.1 flammable gases, that can contribute to cascading hazardous materials releases; if necessary, obtain legislative authority to act on this recommendation. (R-24-14.) (See section 2.4.4.)
- Distribute the Federal Railroad Administration's most current guidance on the vent and burn method to emergency response agencies by referencing it in the next edition of the Emergency Response Guidebook (R-24-15) (See section 2.5.4.)

In the same report, we also classified the following safety recommendation:

- With the assistance of the Federal Railroad Administration, require that railroads immediately provide to emergency responders accurate, real time information regarding the identity and location of all hazardous materials on a train. (R 07 4)
- Safety Recommendation R-07-4 is classified Closed—Acceptable Action in section 2.3.2 of this report.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendation I-24-1, Safety Recommendations R-24-12 through -15, and classified Safety Recommendation R 07 4). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.4.2 Non-Pressure Tank Cars

### 2.4.2.1 DOT-111 Derailment Performance at East Palestine



The DOT-111 and DOT-117 specifications are both non-pressure tank cars in widespread hazardous materials service, and the East Palestine derailment involved both specifications. Postderailment examination of the seven mechanically breached DOT-111 tank cars found that five sustained cracks or punctures in tank heads. This type of damage is consistent with impacts to the tank heads, usually between adjacent railcars as railcars' kinetic energy causes them to collide end-to-end (run-in) and leave the track (create a pileup) during a derailment. This indicates that the single most common failure mode for DOT-111 tank cars in East Palestine was tank head protection insufficient to preserve tank integrity. The DOT-117 tank cars subjected to the same derailment were equipped with full-height head shields and remained mechanically intact, underscoring the greater relative vulnerability of the DOT-111 tank cars to mechanical breaches.

#### 2.4.2.2 Past DOT-111 Derailment Performance and Regulatory Action

The DOT-111 specification's vulnerability to breaches during derailments is a well-documented issue. The NTSB calculated release rates for DOT-111 tank cars in a 1991 safety study titled *Transport of Hazardous Materials by Rail*. The studied period extended from March 1988 through February 1989 and included 45 rail accidents involving 149 tank cars. The study found that 54% of DOT-111 tank cars involved in accidents in 1988–1989 released lading, and that head and shell punctures accounted for 22% of releases (NTSB 1991). The NTSB observed a similar breach rate at East Palestine: the mechanical and thermal crashworthiness performance of DOT-111 tank cars in East Palestine represents a breach rate of 50% (8 of 16 derailed DOT-111s released lading), and a breach rate of 44% from confirmed mechanical damage.

Hazardous materials releases from DOT-111 tank cars have led to several investigations, safety recommendations, and regulatory actions. On June 19, 2009, Canadian National Railway Company ethanol unit train U70691-18 derailed in Cherry Valley, Illinois (NTSB 2012b). Of the 19 DOT-111 tank cars that derailed, 13 were breached and caught fire, resulting in the release of about 324,000 gallons of ethanol. The postderailment fire resulted in one death, nine injuries, and the evacuation of 600 homes within half a mile of the accident. The NTSB found that the inadequate design of the DOT-111 tank cars contributed to the severity of the accident. The NTSB determined that if enhanced tank head and shell puncture-resistance systems such as head shields, tank jackets, and increased shell thicknesses had been features of the DOT-111 tank cars involved in this accident, the release of hazardous materials likely would have been significantly reduced.

As a result of our investigation of the Cherry Valley derailment and fire, the NTSB issued the following safety recommendations to PHMSA: Require that all newly manufactured and existing general service tank cars authorized for transportation of denatured fuel ethanol and crude oil in Packing Groups I and II have enhanced tank head and shell puncture-resistance systems and top fittings protection that exceeds existing design requirements for DOT-111 tank cars. (R-12-5)<sup>136</sup> Require that all bottom outlet valves used on newly manufactured and existing non-pressure tank cars are designed to remain closed during accidents in which the valve and operating handle are subjected to impact forces. (R-12-6)<sup>137</sup>

The NTSB classified Safety Recommendations R-12-5 and R-12-6 Closed—Acceptable Action on July 12, 2016, after PHMSA's adoption of final rule HM-251, which established the DOT-117 specification and required that tank cars in Class 3 flammable liquids service meet the associated standards if used in HHFTs. The DOT-117 specification included the protective features described in the safety recommendations, and we noted in our letter to PHMSA that we commended the decision to require the DOT-117 specification for all Class 3 flammable liquids being transported in HHFTs, not only ethanol and crude oil.

On July 5, 2013, a Montreal Maine and Atlantic freight train with 72 DOT-111 tank cars carrying petroleum crude oil derailed in Lac-Mégantic Quebec, Canada (TSB 2014b).<sup>138</sup> Following a crew change, the train was left unattended on the mainline track. The train began to move uncontrolled on a descending grade, derailling 63 tank cars that released 1.6 million gallons of crude oil that ignited and killed 47 people.

The NTSB issued safety recommendations derived from its participation in the Transportation Safety Board of Canada's (TSB) investigation. Because the Cherry Valley recommendations regarding DOT-111 were recent and still open, our recommendations following Lac-Mégantic addressed safety issues other than the low survivability of DOT-111 tank cars. However, in safety recommendation letters addressed to PHMSA and the FRA, the NTSB noted the potential destructive effects of large numbers of derailed DOT-111 tank cars containing flammable materials and referenced other relevant NTSB investigations, including:

- The July 11, 2012, NS train derailment in a Columbus, Ohio, industrial area, in which three derailed DOT-111 tank cars released about 53,000 gallons of ethanol, with energetic rupture of one tank car in a postderailment fire (NTSB 2014b).



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- The October 7, 2011, derailment of an Iowa Interstate Railroad train in Tiskilwa, Illinois, of 10 DOT-111 tank cars, resulting in fire, energetic rupture of several tank cars, and the release of 162,000 gallons of ethanol (NTSB 2013a).
- The October 20, 2006, NS ethanol unit train derailment in New Brighton, Pennsylvania, in which 23 DOT-111 tank cars derailed, fell from a bridge, caught fire, and released more than 485,000 gallons of ethanol (NTSB 2008).

On December 30, 2013, a westbound BNSF Railway train derailed 13 railcars transporting grain in Casselton, North Dakota, fouling the adjacent main track (NTSB 2017d). An eastbound BNSF Railway train with 104 tank cars loaded with petroleum crude oil struck a derailed railcar. The collision derailed 20 DOT-111 tank cars from the eastbound train; 18 tank cars were breached and released about 476,000 gallons of crude oil that subsequently caught fire. DOT-111 tank cars that released lading included 13 with torn or punctured heads and shells, 3 with thermal tears, 10 with damaged valves and fittings, and 3 that released product from BOVs. The investigation noted that the release was made more severe by the pooling of a flammable liquid that caught fire and caused additional tank cars to fail.

The NTSB adopted its report for Casselton on February 7, 2017, and released it on March 9, 2017, but because another NTSB derailment investigation involving DOT-111 tank cars led to urgent recommendations before the Casselton investigation was complete, the Casselton report classified existing safety recommendations relevant to the DOT-111 specification instead of issuing new ones. This additional investigation concerned the February 16, 2015, derailment of 27 loaded DOT-111 tank cars from a CSX Transportation crude oil unit train in Mount Carbon, West Virginia.<sup>139</sup> The tank cars were constructed to the CPC-1232 standard, but none had thermal protection. During the derailment, two tank cars were punctured and released more than 50,000 gallons of crude oil. Nineteen tank cars became involved in a postderailment pool fire that caused thermal tank shell failures on 13 tank cars that had otherwise survived the derailment. During our investigation, the NTSB collected information about three additional derailments in which 15 other CPC-1232 thermally failed and released thousands of gallons of flammable crude oil.<sup>140</sup>

The NTSB noted that the DOT-111 tank cars (including those manufactured to the CPC-1232 standard) were not required to be equipped with thermal protection systems to protect the tank from exposure to pool or torch fire conditions. In our recommendation letter to PHMSA, the NTSB concluded: The thermal performance and pressure relief capacity of bare steel tank cars that conform to current federal and industry requirements is insufficient to prevent tank failures from pool fire thermal exposure and the resulting overpressurization.

As the result of our investigation, the NTSB issued urgent safety recommendations to PHMSA: Require that all new and existing tank cars used to transport all Class 3 flammable liquids be equipped with thermal protection systems that meet or exceed the thermal performance standards outlined in Title 49 Code of Federal Regulations 179.18(a) and are appropriately qualified for the tank car configuration and the commodity transported. (R-15-14, Urgent)<sup>141</sup> In conjunction with thermal protection systems called for in safety recommendation R-15-14, require that all new and existing tank cars used to transport all Class 3 flammable liquids be equipped with appropriately sized pressure relief devices that allow the release of pressure under fire conditions to ensure thermal performance that meets or exceeds the requirements of Title 49 Code of Federal Regulations 179.18(a), and that minimizes the likelihood of energetic thermal ruptures. (R-15-15, Urgent)<sup>142</sup> Require an aggressive, intermediate progress milestone schedule, such as a 20 percent yearly completion metric over a 5-year implementation period, for the replacement or retrofitting of legacy DOT-111 and CPC-1232 tank cars to appropriate tank car performance standards, that includes equipping these tank cars with jackets, thermal protection, and appropriately sized pressure relief devices. (R-15-16, Urgent)

PHMSA published final rule HM-251 before publication of the NTSB's report on the Casselton derailment. Final rule HM-251 created the DOT-117 specification, which includes thermal performance standards, and required the specification's use in HHFTs. However, as the NTSB noted in its letter to PHMSA on July 12, 2016, the final rule did not require thermal protection systems or PRDs on all tank cars in Class 3 flammable liquids service—only tank cars used in HHFTs. Because PHMSA was still drafting regulations associated with the passage of the FAST Act, the NTSB classified Safety Recommendations R-15-14 and R-15-15 Open—Acceptable Response. On August 15, 2016, after passage of the FAST Act, PHMSA issued final rule HM-251C, establishing a phase-out schedule for all tank cars in Class 3 flammable liquids service, including tank cars in non-HHFT trains. The NTSB classified Safety Recommendations R-15-14 and R-15-15 Closed—Acceptable Action in our report on the Casselton derailment (NTSB 2017d). We noted in our March 3, 2017, letter to PHMSA that:

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#### 2.4.2.3 Acceleration of DOT-111 Tank Car Phase Out

The DOT-111 specification's known poor derailment performance warrants removing the specification from hazardous materials service as quickly as possible. Although its ability to accelerate the phase out of DOT-111 tank cars is curtailed by the FAST Act, PHMSA has acknowledged the safety benefits of an expedited replacement or retrofit schedule. In response to the East Palestine derailment, PHMSA urged companies that own and use DOT-111 tank cars in flammable liquids service to consider replacing them with DOT-117 or DOT-117R specification tank cars as soon as practicable in the interest of public safety (PHMSA 2023b). As stated in its March 22, 2023, safety advisory, PHMSA believes it is possible for tank car owners and the shipping industry to acquire enough DOT-117 tank cars for flammable liquids service well before the May 1, 2029, phase-out date mandated by the FAST Act (PHMSA 2023b). PHMSA also expressed confidence that this can be accomplished with existing shop capacity. Similarly, the FRA's January 2024 report on its Legacy Tank Car Focused Inspection Program noted that the Railway Supply Institute has previously indicated that it may be technically and operationally feasible to accelerate the May 2029 DOT-111 phase-out deadline by 1 year (FRA 2024).

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#### 2.4.2.4 Non-pressure Tank Cars in Other Hazardous Materials Service

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materials releases from PRDs fitted to pressure tank cars—pressure tank cars that remained intact during the derailment and otherwise would have retained lading. The East Palestine derailment demonstrates that hazardous materials tank cars with relatively poor derailment survivability can adversely affect the lading retention of more resilient tank cars, such as DOT-105 tank cars. The NTSB concludes that the presence of DOT-111 tank cars carrying hazardous materials in a mixed freight train increases the risk of lading releases from other, more resilient tank cars during a derailment.

The FAST Act does not require non-pressure tanks used to transport combustible or other non-flammable hazardous materials to meet the DOT-117 specification. This means there is no phase-out schedule for DOT-111, AAR-211, or CPC-1232 tank cars in other than flammable liquids service (such as combustible or other non-flammable hazardous materials). Of the three DOT-111 tank cars that released hazardous materials during the East Palestine derailment, two were transporting combustible liquids and therefore were not subject to the FAST Act. Therefore, the NTSB recommends that PHMSA establish a tank car replacement schedule whereby non-pressure tank cars in any hazardous materials service must meet or exceed the safety standards of the DOT-117 specification; if necessary, obtain legislative authority to act on this recommendation.

| 10/11/24                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Addressee | Official Correspondence | 73823 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|-------|
| -From Tristan H. Brown, Deputy Administrator: PHMSA concurs with NTSB’s SR to establish a tank car replacement schedule whereby non-pressure tank cars in any hazardous materials service must meet or exceed the safety standards of the DOT-117 specification. As a first step to address this SR, PHMSA has begun conducting a risk-based analysis to determine both the economic effects of different approaches as well as the expected impacts on safety.    |           |                         |       |
| Since 2015, PHMSA has made substantial progress in phasing out the DOT-111 and requiring the use of DOT-117 tank cars for flammable liquid service. PHMSA believes that similar safety gains are possible for other hazardous materials service. PHMSA welcomes congressional action that would support a more rapid phase out of DOT-111s for other hazardous materials service and has engaged Congress and provided technical assistance related to this issue. |           |                         |       |



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |                    |                                  |                                  |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------|----------------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      | R-24-014           | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Revise the definition of high hazard flammable train to account for differences in survivability between tank car specifications and to include hazardous materials other than flammable liquids, such as combustible liquids and Division 2.1 flammable gases, that can contribute to cascading hazardous materials releases; if necessary, obtain legislative authority to act on this recommendation.                                                                                                                                                                                                                                                                                                                  |      |                    |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |      | 1                  | <b>Overall Date Closed:</b>      |                                  | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      | PHMSA              | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |
| <b>07/12/24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | NTSB | Transmittal Letter | 73264                            |                                  |          |
| The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbt.gov">http://www.ntsbt.gov</a> .                                                                                                                                                                                                                                                                                                                                                                                     |      |                    |                                  |                                  |          |
| The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, I-24-001, R-24-012 through R-24-015). We encourage you to submit your response to <a href="mailto:ExecutiveSecretariat@ntsbt.gov">ExecutiveSecretariat@ntsbt.gov</a> . If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response. |      |                    |                                  |                                  |          |
| This letter provides information about the National Transportation Safety Board’s (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbt.gov">http://www.ntsbt.gov</a> .                                                                                                                                                                                                                                                                                                                                             |      |                    |                                  |                                  |          |
| As a result of this investigation, we identified the following safety issues:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |                    |                                  |                                  |          |
| <ul style="list-style-type: none"><li>• Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;</li><li>• Inadequate emergency response training for volunteer first responders;</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |                    |                                  |                                  |          |



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- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Pipeline and Hazardous Materials Safety Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Require that placards be able to survive fires and accidents and remain legible during such emergencies long enough to fulfill their functions as described in the Emergency Response Guidebook. (I 24 1) (See section 2.3.3.)
- Obtain the necessary legislative authority and accelerate the deadline for removing specification DOT 111 tank cars from flammable liquids service. (R-24-12) (See section 2.4.2.)
- Establish a tank car replacement schedule whereby non-pressure tank cars in any hazardous materials service must meet or exceed the safety standards of the DOT-117 specification; if necessary, obtain legislative authority to act on this recommendation. (R-24-13) (See section 2.4.2.)
- Revise the definition of high hazard flammable train to account for differences in survivability between tank car specifications and to include hazardous materials other than flammable liquids, such as combustible liquids and Division 2.1 flammable gases, that can contribute to cascading hazardous materials releases; if necessary, obtain legislative authority to act on this recommendation. (R-24-14.) (See section 2.4.4.)
- Distribute the Federal Railroad Administration's most current guidance on the vent and burn method to emergency response agencies by referencing it in the next edition of the Emergency Response Guidebook (R-24-15) (See section 2.5.4.)

In the same report, we also classified the following safety recommendation:

- With the assistance of the Federal Railroad Administration, require that railroads immediately provide to emergency responders accurate, real time information regarding the identity and location of all hazardous materials on a train. (R 07 4)
- Safety Recommendation R-07-4 is classified Closed—Acceptable Action in section 2.3.2 of this report.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendation I-24-1, Safety Recommendations R-24-12 through -15, and classified Safety Recommendation R 07 4). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.4.4 High-Hazard Flammable Trains

Following our participation in the TSB's investigation of the Lac-Mégantic, Quebec, derailment and fire involving a crude oil unit train,



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the NTSB issued the following safety recommendations to the FRA: Work with the Pipeline and Hazardous Materials Safety Administration to expand hazardous materials route planning and selection requirements for railroads under Title 49 Code of Federal Regulations 172.820 to include key trains transporting flammable liquids as defined by the Association of American Railroads Circular No. OT-55-N and, where technically feasible, require rerouting to avoid transportation of such hazardous materials through populated and other sensitive areas. (R-14-1)<sup>147</sup> We issued a corresponding recommendation to PHMSA: Work with the Federal Railroad Administration to expand hazardous materials route planning and selection requirements for railroads under Title 49 Code of Federal Regulations 172.820 to include key trains transporting flammable liquids as defined by the Association of American Railroads Circular No. OT-55-N and, where technically feasible, require rerouting to avoid transportation of such hazardous materials through populated and other sensitive areas. (R-14-4)

In response, PHMSA issued an NPRM on August 1, 2014, titled “Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains” (79 Fed. Reg. 45016).<sup>149</sup> In our comments on the NPRM, we noted several concerns with the proposed rule. One touched on a possible misapplication of Safety Recommendation R-14-4: Safety Recommendation R-14-4 urges PHMSA to include “key trains” carrying flammable liquids in its route-planning requirement. The recommendation refers to the definition of key train in AAR Circular No. OT-55-N, which lists 20 tank cars of any combination of hazardous material as the threshold number of tank cars in the consist. In referring to the AAR circular, we intended to suggest using a preexisting industry standard for route planning, but not to endorse a 20-tank-car threshold for HHFTs. We caution you not to use Safety Recommendation R-14-4 to imply that we endorse a 20-tank-car threshold for any other purpose.

We also noted the narrow range of hazardous materials encompassed by the HHFT definition, which included only Class 3 flammable liquids:

We believe the definition should include a broad range of hazardous materials, similar to the revised definition of a key train in AAR Circular No. OT-55-N. The circular’s reference to “any combination of hazardous material” includes hazard class 2, division 2.1 (flammable gas) materials and combustible liquids, as defined at 49 CFR 173.115(a) and 173.120(b).

On May 8, 2015, PHMSA published the final rule, HM-251, defining an HHFT as a train with 20 or more tank cars transporting a Class 3 flammable liquid in a single block or 35 or more such tank cars throughout the consist (80 Fed. Reg. 26644). As a result, the NTSB classified Safety Recommendations R-14-1 and R-14-4 Closed—Acceptable Action on September 16, 2015. The FAST Act, signed into law December 4, 2015, includes a statutory definition of HHFT that uses the same tank car counts and commodities; under the FAST Act, PHMSA no longer has the discretion to change the definition of HHFT (PL 114-94).

The rules governing the operation of HHFTs are designed to prevent or mitigate a derailment involving a large number of flammable liquids tank cars, partially to reduce the risk of one breached tank car compromising others. When exposed to fire conditions, flammable liquids tank cars can experience a cascade of releases as each breached tank car spreads the fire to involve more tank cars. The risk and potential scope of this cascading failure mode increases with greater numbers of flammable liquids tank cars.

Train 32N was not an HHFT, but the NTSB’s investigation determined that the sequence of hazardous materials releases was similar to what the HHFT rules are designed to prevent. The East Palestine derailment led to mechanical breaches in DOT-111 tank cars that released flammable and combustible liquids, caused fires that exposed more tank cars to heat, and eventually released a Class 2.1 flammable gas through PRD actuation from DOT-105 tank cars that were mechanically intact. The sequence of hazardous materials releases observed at East Palestine shows that non-HHFT mixed freight trains are vulnerable to cascading hazardous materials releases if the consist includes hazardous materials and tank cars relatively likely to compromise the lading retention of other tanks cars in the consist. The breached DOT-111 tank cars caused other tank cars to release lading even though train 32N had fewer than 20 (or 35) hazardous materials tank cars and even though most of the hazardous materials in the derailed tank cars were not Class 3 flammable liquids.

While it is unclear whether applying the operating requirements for HHFTs to train 32N would have mitigated the postderailment fires, the postderailment releases show that the release scenario addressed by HHFT regulations is not confined to HHFT trains: the specifics of tank car derailment performance and presence of non-flammable liquids hazardous materials are both relevant to assessing a mixed freight train’s level of hazard. Therefore, the NTSB concludes that cascading hazardous materials releases are not unique to HHFTs, and the probability of a cascading hazardous materials release depends in part on variations in tank car survivability and on the presence of hazardous materials other than Class 3 flammable liquids, such as combustible liquids and Division 2.1 flammable gases. Accordingly, the NTSB recommends that PHMSA revise the definition of HHFT to account for differences in survivability between tank car specifications and to include hazardous materials other than flammable liquids, such as



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combustible liquids and Division 2.1 flammable gases, that can contribute to cascading hazardous materials releases; if necessary, obtain legislative authority to act on this recommendation.

| 10/11/24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Addressee | Official Correspondence | 73823 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|-------|
| -From Tristan H. Brown, Deputy Administrator: PHMSA concurs with the SR and notes that legislative action would be required to revise the definition of "high-hazard flammable train" because this definition is codified in the FAST Act Section 7302. PHMSA has engaged with Congress on the subject and provided technical assistance in an effort to a legislative update. PHMSA also aims to address the SR through a rulemaking effort to propose implementing regulatory requirements and operational controls on a larger set of newly designated train makeups. PHMSA has initiated a rulemaking to this effect under RIN 2137-AF65 (HM-251G). Additional information on HM-251G is available on the Office of Information and Regulatory Affairs Unified Agenda website at <a href="https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202404&amp;RIN=2137-AF65">https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202404&amp;RIN=2137-AF65</a> . |           |                         |       |



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

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| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | R-24-015 | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: Distribute the Federal Railroad Administration's most current guidance on the vent and burn method to emergency response agencies by referencing it in the next edition of the Emergency Response Guidebook.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1        |                                  | <b>Overall Date Closed:</b>      | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | PHMSA    | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |
| <b>07/12/24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | NTSB     | Transmittal Letter               | 73264                            |          |
| The attached letter from the NTSB Chair provides information about the Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbt.gov">http://www.ntsbt.gov</a> .                                                                                                                                                                                                                                                                                                                                                                                     |          |                                  |                                  |          |
| The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendations by number (for example, I-24-001, R-24-012 through R-24-015). We encourage you to submit your response to <a href="mailto:ExecutiveSecretariat@ntsbt.gov">ExecutiveSecretariat@ntsbt.gov</a> . If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response. |          |                                  |                                  |          |
| This letter provides information about the National Transportation Safety Board's (NTSB) June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <a href="http://www.ntsbt.gov">http://www.ntsbt.gov</a> .                                                                                                                                                                                                                                                                                                                                             |          |                                  |                                  |          |
| As a result of this investigation, we identified the following safety issues:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |          |                                  |                                  |          |
| <ul style="list-style-type: none"><li>• Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;</li><li>• Inadequate emergency response training for volunteer first responders;</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |                                  |                                  |          |



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- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Pipeline and Hazardous Materials Safety Administration. Additional information regarding these recommendations can be found in the noted sections of the report.

- Require that placards be able to survive fires and accidents and remain legible during such emergencies long enough to fulfill their functions as described in the Emergency Response Guidebook. (I 24 1) (See section 2.3.3.)
- Obtain the necessary legislative authority and accelerate the deadline for removing specification DOT 111 tank cars from flammable liquids service. (R-24-12) (See section 2.4.2.)
- Establish a tank car replacement schedule whereby non-pressure tank cars in any hazardous materials service must meet or exceed the safety standards of the DOT-117 specification; if necessary, obtain legislative authority to act on this recommendation. (R-24-13) (See section 2.4.2.)
- Revise the definition of high hazard flammable train to account for differences in survivability between tank car specifications and to include hazardous materials other than flammable liquids, such as combustible liquids and Division 2.1 flammable gases, that can contribute to cascading hazardous materials releases; if necessary, obtain legislative authority to act on this recommendation. (R-24-14.) (See section 2.4.4.)
- Distribute the Federal Railroad Administration's most current guidance on the vent and burn method to emergency response agencies by referencing it in the next edition of the Emergency Response Guidebook (R-24-15) (See section 2.5.4.)

In the same report, we also classified the following safety recommendation:

- With the assistance of the Federal Railroad Administration, require that railroads immediately provide to emergency responders accurate, real time information regarding the identity and location of all hazardous materials on a train. (R 07 4)
- Safety Recommendation R-07-4 is classified Closed—Acceptable Action in section 2.3.2 of this report.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendation I-24-1, Safety Recommendations R-24-12 through -15, and classified Safety Recommendation R 07 4). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.4 Vent and Burn Criteria

The FRA recognizes the vent and burn method as a valid but high-risk last-resort procedure for unloading tank cars transporting at least certain compressed liquified flammable gases, as shown by its 1994 and 2007 guidance on the method. The second 2007 report



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(Phase II of the associated study) includes guidance on when a vent and burn should be considered, what commodities are candidates for the procedure, and how an incident command should approach the decision (FRA 2007a). At least one individual involved in the East Palestine emergency response had knowledge of the 2007 study and Phase II report; the NS regional hazardous materials manager, then employed by the AAR, was one of the contributing authors. However, there is no evidence that the specific guidance in the Phase II report was used during the vent and burn decision, and the incident commander was not aware of the report's existence. Even if he had known about the report, he would not have had ready access to it because of the report's status as Sensitive Security Information. While it is unclear whether access to the Phase II report would have led the incident commander to a different decision, the report would have provided him with additional information and the tools needed to ask further questions of NS and its contractors. The Phase II report's guidance, cautions, and checklists would have provided the incident commander with additional knowledge and resources when deciding whether to approve the vent and burn. The presence of public, well-known criteria for when to attempt vent and burn procedures would also have provided a baseline for conversations among NS, its contractors, and the rest of the incident command.

On May 6, 2007, the FRA released publicly available versions of the Phase I and Phase II reports on its website, but web publication may not be sufficient to distribute this guidance. The 1994 handbook was available on the FRA's website at the time of the East Palestine derailment but was not consulted during the lead-up to the vent and burn. The NTSB is concerned that the FRA's most recent and complete guidance about when to attempt the vent and burn method has not been widely disseminated to emergency responders. A vent and burn procedure was not necessary in East Palestine to prevent a BLEVE, but what was true in East Palestine may not hold in other circumstances or for other products. The NTSB concludes that the significant local and environmental impacts of a vent and burn decision demonstrate the need for federal guidance about what products and circumstances are candidates for the vent and burn method. The NTSB recommends that the FRA distribute the public versions of its 2007 vent and burn reports to emergency responder associations, including the IAFC, IAFF, and NVFC. To increase awareness of federal guidance, the NTSB recommends that the IAFC, IAFF, and NVFC advise their members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate.

While the 2007 reports contain useful guidance, they were developed before the East Palestine vent and burn and therefore do not incorporate lessons learned from that accident. The Phase II report does not advise an incident command to contact the shipper when considering a vent and burn, for example, instead directing the incident commander to a database that has not been widely distributed. The checklist provided in the Phase II report does not always clearly indicate how the answers to its questions should shape a vent and burn decision. For example, it includes a row for product viscosity (high, medium, or low) but does not clearly explain how an incident command can determine viscosities or how different viscosities will affect a vent and burn (FRA 2007a). The NTSB recommends that the FRA update and re-publish its 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re-published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. The NTSB also recommends that the FRA make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the IAFC, IAFF, and NVFC. The NTSB also recommends that PHMSA distribute the FRA's most current guidance on the vent and burn method to emergency response agencies by referencing it in the next edition of the ERG.

10/11/24

Addressee

Official Correspondence

73823



# Recommendation Report

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-From Tristan H. Brown, Deputy Administrator: PHMSA concurs with the SR to ensure that emergency responders have access to the most current guidance on tank car vent and burn methodology. PHMSA will collaborate with the Federal Railroad Administration to disseminate the updated guidance as soon as it is available.

In addition, the Emergency Response Guidebook (ERG) is a joint publication between the US DOT, Transport Canada, and Secretariat of Communication and Transport of Mexico. All changes to the content and structure of the ERG must be reviewed and approved by all parties involved. PHMSA will bring this SR to the committee and champion a solution that addresses the concern.

The next edition of the ERG will not be available until 2028. In the interim, PHMSA will pursue an alternative approach to raise awareness and make available the updated vent and burn guidance. PHMSA is committed to ensuring that emergency responders have access to the most up-to-date information on the vent and burn method.

PHMSA looks forward to working with you on these important safety initiatives. If you have any questions, please do not hesitate to contact me, or you may contact Dirk Der Kinderen, Chief of Standards Development for PHMSA's Office of Hazardous Materials Safety.



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

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| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      | R-24-016           | <b>Overall Status:</b>     | Open - Acceptable Response  | CLASS II |
| TO THE STATE OF OHIO: Amend your firefighter training statute and revise your volunteer firefighter certification standards to meet the NFPA 1010 standard for professional firefighters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |                    |                            |                             |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      | 1                  |                            | <b>Overall Date Closed:</b> | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      | State of Ohio      | Open - Acceptable Response | <b>Date Closed:</b>         | N/A      |
| <b>07/12/24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | NTSB | Transmittal Letter |                            | 73264                       |          |
| <p>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 cause 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 any accident or event investigated by the agency. 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.</p> <p>The attached letter from the NTSB Chair provides information about the NTSB’s June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <a href="http://www.ntsbgov">http://www.ntsbgov</a>. For more information about NTSB and our recommendation process, please see the attached one-page summary.</p> <p>The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-016). We encourage you to submit your response to <a href="mailto:ExecutiveSecretariat@ntsb.gov">ExecutiveSecretariat@ntsb.gov</a>. If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.</p> <p>All communications regarding safety recommendations will be stored by the NTSB and viewable by the public. Please do not send privileged or confidential communications in response to this recommendation. Responses marked as confidential or privileged (or similar designations) will be considered nonresponsive. If you have concerns about this protocol, please contact us at</p> |      |                    |                            |                             |          |



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ExecutiveSecretariat@ntsb.gov.

The National Transportation Safety Board (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.

We are providing the following information to urge the State of Ohio to act on the safety recommendation in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendation to the State of Ohio. Additional information regarding this recommendation can be found in the noted section of the report.

- Amend your firefighter training statute and revise your volunteer firefighter certification standards to meet the NFPA 1010 standard for professional firefighters. (R-24-16) (See section 2.3.1.)

The NTSB is vitally interested in this recommendation because it is designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement this recommendation. When replying, please refer to the safety recommendation by number (Safety Recommendation R-24-16). We encourage you to submit your response to ExecutiveSecretariat@ntsb.gov. If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

All communications regarding safety recommendations are stored by the NTSB and viewable by the public. Please do not send privileged or confidential communications in response to this recommendation. Responses marked as confidential or privileged (or similar designations) will be considered nonresponsive. In the likely event that your company uses auto generated and/or preformatted confidentiality statements on letterhead or outgoing e-mails, please include a statement in your letter indicating that the



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information can be publicly released. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov).

From the report RIR-24-05 “Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023” published on July 12, 2024:

## 2.3.1 Initial Deployment of Firefighters

The EPFD responded to 911 calls and reached the accident scene within 10 minutes of the derailment. During this stage of the emergency response, EPFD firefighters did not have access to the consist of train 32N but had observed tank cars among the derailed and burning equipment. The applicable guidance from the 2020 ERG was the “Mixed Load / Unidentified Cargo” entry for a fire involving tank cars, which advised a half-mile (or 2,640-foot) preliminary isolation and evacuation of the scene, noted the need for self-contained breathing apparatuses, and cautioned that materials may react violently with extinguishing agents, including water (PHMSA 2020). The entry recommended the use of water to cool containers but cautions against allowing water to enter those containers.

The EPFD deputy fire chief set up a command post at a business about 400 feet from the burning train, more than 2,000 feet inside the ERG-recommended isolation and evacuation zone. Without referencing the 2020 ERG, volunteer firefighters approached the pileup and began applying water to contain the fire, which grew rapidly. Firefighters were equipped with self-contained breathing apparatuses, but without more information about the train’s consist, the incident commander had no way of determining whether this personal protective equipment was adequate for operations within the half-mile isolation zone. The NTSB concludes that, while the EPFD deputy fire chief and other volunteer firefighters acted in good faith to protect their community, the initial emergency response did not conform to ERG guidance for fires involving tank cars and unknown materials; both the proximity of the first command post to the fire and the use of manned hoses near a fire involving unknown materials placed these firefighters at unnecessary risk.

Pre-certification volunteer firefighter training in Ohio is limited by statute under State of Ohio Revised Code Section 4765.55. A training course for a Volunteer Firefighter certificate may not exceed 36 hours. According to guidance distributed by Ohio EMS, the foundational volunteer firefighter course does not permit participation in training involving hazardous environments because of this time constraint (Ohio EMS 2023). The basic 36-hour training course does not meet the NFPA 1010 standard for professional firefighters (or the NFPA 1001 standard in place at the time of the derailment), which requires a minimum of 160 hours of training and includes job performance requirements not addressed in the volunteer course. Fire chiefs or authorities having jurisdiction are responsible for providing additional training for volunteer firefighters expected to operate in hazardous environments. However, the statute does not specify minimum standards, specific courses, or demonstration of skills or knowledge to ensure that additional training adequately prepares firefighters for hazardous environments. The EPFD deputy fire chief had completed two additional courses in hazardous materials awareness and operations in 2022, but the response in East Palestine still deviated from recommended practices by placing firefighters near burning tank cars and establishing a command post a few hundred feet from a fire involving unknown hazardous materials.

Statutory requirements and training courses for professional firefighters in Ohio meet the relevant NFPA 1010 standard. However, the NTSB is concerned that volunteer fire departments in the state of Ohio are called on to respond to the same incidents as their professional counterparts, as seen in this accident, but that volunteers may have only a fraction of the training Ohio requires for professional firefighters: 36 hours instead of at least 160 hours. Further, the Ohio statute significantly limits initial training for volunteers and has resulted in a prohibition on training in hazardous environments. While the statute instructs local authorities to provide additional training, it establishes no clear requirements or guidance on what additional training is appropriate. The EPFD personnel who responded to the derailment and fire had varying training levels related to hazardous materials that ranged from no training at all to technician-level training, but the NTSB has not found evidence that their roles in the initial emergency response were tailored to their individual training levels. The NTSB concludes that the state of Ohio’s statutory requirements for volunteer firefighter training were insufficient to support a safe emergency response to the East Palestine derailment led by a volunteer fire department. Therefore, the NTSB recommends that the state of Ohio amend its firefighter training statute and revise its volunteer firefighter certification standards to meet the NFPA 1010 standard for professional firefighters.

The National Volunteer Fire Council (NVFC) represents the interests of the volunteer fire, EMS, and rescue services. The International Association of Fire Chiefs (IAFC) represents the interests of emergency responders with a focus on leaders. The International Association of Fire Fighters (IAFF) is a labor union representing firefighters, emergency medical workers, and rescue workers in the United States and Canada.<sup>126</sup> These organizations provide resources, programs, education, and advocacy for emergency responders and are positioned to encourage adoption of standards to protect their members’ safety, including identifying



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trainings and sources of funding. Thus, the NTSB recommends that the NVFC, IAFC, and IAFF advise their members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs. The NTSB also recommends that the NVFC identify barriers to adequate fire and emergency response training for volunteer firefighters, particularly for situations where hazardous materials are present, and publish actions states, municipalities, and the private sector can take to provide the flexibility necessary for volunteer firefighters to obtain training.

**10/11/24**

Addressee

Official Correspondence

73828

-From Mike DeWine, Governor of Ohio: Thank you for your investigation and report, Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023.

Your report recommends that the State of Ohio amend our firefighter training statute and revise our volunteer firefighter certification standards to meet the NFPA 1010 standard for professional firefighters to ensure that all of our fire fighters have hazardous materials awareness training. I am glad to share that Ohio is already taking steps to align with this recommendation.

Today, Ohio is phasing in a new requirement for hazardous material awareness training as part of our new training requirements for all new volunteer fire fighter certifications. Additionally, we will require current certified volunteer fire fighters to have this training completed by 2030 in order to receive recertification. The transition time will allow all 1,180 fire departments across the State several budget cycles to plan for associated expenses to complete these transformations.

Also, Ohio is making firefighting training more accessible through a recently launched hybrid training option. Improving student convenience to training will enhance recruitment and improve training opportunities, especially throughout rural Ohio.

Again, thank you for your investigation and report regarding the February 3, 2023, East Palestine train derailment. These changes will yield improved volunteer fire service readiness to respond to emergencies throughout Ohio communities.

Please reach out to us if you need additional information about Ohio's firefighter training statute and our volunteer firefighter certification and training standards.

**01/14/25**

NTSB

Official Correspondence

73828

We issued this recommendation because our investigation concluded that Ohio's statutory requirements for volunteer firefighter training were insufficient to support a safe emergency response to the East Palestine derailment. We note that Ohio is phasing in a new requirement for hazardous materials training for all new volunteer firefighters and is requiring current certified volunteer firefighters to complete this training requirement by 2030. Your state is also making firefighter training more accessible by offering new hybrid training options that you believe will enhance recruitment and training throughout the state.

These actions are a step in the right direction toward implementing this recommendation; however, it is not clear if your new requirements meet the NFPA 1010 standard. Please describe your revised requirements for volunteer firefighter training and confirm that the training meets the NFPA 1010 standard for professional firefighters, as recommended. Pending our review of that information, Safety Recommendation R-24-16 is classified OPEN-- ACCEPTABLE RESPONSE.

Please send us the requested information at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov), and do not send both an electronic and a hard copy of the same response.



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                   |                                                                  |          |                                  |                                  |          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|----------|----------------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                         |                                                                  | R-24-017 | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO THE COLUMBIANA COUNTY EMERGENCY MANAGEMENT AGENCY: Adopt a policy to, upon receipt of a train consist, immediately provide it to the incident commander and all appropriate response agencies and departments. |                                                                  |          |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                           |                                                                  | 1        | <b>Overall Date Closed:</b>      |                                  | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                 | State of Ohio, County of Columbiana, Emergency Management Agency |          | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |

**07/12/24** NTSB Transmittal Letter 73264

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 cause 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 any accident or event investigated by the agency. 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 attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-017 and R-24-018). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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similar designations) will be considered nonresponsive. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov).

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We are providing the following information to urge the Columbiana County Emergency Management Agency to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Columbiana County Emergency Management Agency. Additional information regarding these recommendations can be found in the noted sections of the report.

- Adopt a policy to, upon receipt of a train consist, immediately provide it to the incident commander and all appropriate response agencies and departments. (R-24-17) (See section 2.3.2.)
- Update your Emergency Operations Plan, Hazardous Materials Response Plan, and Hazard Mitigation Plan, as appropriate, with lessons learned from the East Palestine derailment and fire, including, at a minimum, coordination among response agencies, communications, requests for and distribution of the train consist, staging and availability of equipment and other resources, and training for emergency responders. (R-24-18) (See section 2.3.2.)



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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.3.2 Communication and Consist Information

The NS Cleveland East dispatcher confirmed that the crew of train 32N had experienced an emergency about 8:56 p.m. Emergency responders made their first request for consist information about 9:04 p.m. by calling the NS dispatch center in Atlanta, Georgia, which did not provide the requested information at that time. Consist information did not reach emergency responders until shortly before 10:00 p.m., when the NS regional hazardous materials manager emailed the consist to the CCEMA director while driving to the scene. About the same time, phone calls were taking place between NS personnel, the EPFD fire chief, and the incident commander. Through these calls, the incident commander became aware of two hazardous materials in the consist: benzene and VCM. After 10:00 p.m., consist information spread piecemeal through responding agencies and personnel. In interviews with the NTSB, emergency responders reported issues with radio interoperability and characterized the overall incident command as fractured or chaotic. Not until about 11:00 p.m., at the recommendation of the Ohio State Patrol, did the EPFD deputy fire chief, acting as the incident commander, issue a 1-mile evacuation—the distance recommended by the 2020 ERG for fires involving tank cars transporting VCM or isobutylene.<sup>127</sup> About the same time, NS personnel and contractors began arriving on the scene and recommending that firefighters redeploy to safer distances. Firefighters suspended fire suppression activities and relocated to safer positions around midnight on February 4. As part of the movement to safer locations, the deputy fire chief moved the command post to the combined police and fire station about a mile from the derailment site.

The emergency response effort involved many agencies from multiple jurisdictions and three states. The two hazardous materials teams dispatched to the scene—the East Liverpool and Beaver County teams—were unable to establish radio communications with the incident commander or other EPFD personnel, and concerns about radio communication led the Beaver County director of emergency services to share hazardous materials information with Beaver County fire departments directly in the expectation that radio issues might otherwise prevent them from receiving that information. The East Liverpool fire chief addressed the lack of radio interoperability by assigning personnel from his own team to stay in the command post so that his radio communications could reach other personnel stationed there.

These approaches to overcoming lack of interoperability reflect ingenuity and awareness of risk in the face of a challenging situation. However, reliance on face-to-face communications and lack of common channels to support interoperability reduce the efficiency of information sharing. The NTSB concludes that because there were not common radio channels between all responding agencies, the emergency response lacked efficient coordination.

Interoperability is a goal set by the 2019 NECP, the national roadmap for ensuring effective communications under NIMS. The standards and methods described in the 2019 NECP and integrated into the overall NIMS doctrine remain the preferred approach to ensuring efficient, effective communication between emergency responders, and the fundamentals of interoperability are addressed in the associated training courses. CISA maintains a regularly updated list of federal financial assistance programs intended to support investment in emergency communications.<sup>128</sup>

The NTSB is concerned that complete and accurate consist information was not quickly and clearly communicated to the incident



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command after East Palestine dispatch contacted NS by phone and requested it. The slow provision of consist information to a single point of contact, followed by partial information provided over the phone to the incident commander, and then the slow distribution among responding agencies, delayed the evacuation to the ERG-recommended distance and protracted the time firefighters spent responding to an unknown set of hazards. Slow transmittal and distribution also delayed the Ohio State Patrol's recommendation to the incident commander that the shelter-in-place order be replaced by an evacuation, the response recommended in the 2020 ERG. The NTSB concludes that the delayed transmittal of consist information by NS to emergency responders needlessly increased the time emergency responders spent near the derailment pileup and delayed the evacuation order, resulting in unnecessary and increased exposure of emergency responders and the public to postderailment hazards.

In response to this accident, NS began integrating its emergency response notification process with RapidSOS, a digital platform designed to provide emergency responders with real-time consist information and notify NS of 911 calls reporting track emergencies in NS's rail network. This change is intended to make consist information available to first responders sooner and allow NS to begin responding to emergencies as soon as 911 calls are made. However, these changes may not address the specific problem present at East Palestine: an incoming request for information from a dispatch center remaining unanswered. The NTSB recommends that NS review and revise its procedures to immediately provide emergency responders with an accurate copy of the train consist upon becoming aware of an accident. The NTSB recommends that CCEMA adopt a policy to, upon receipt of a train consist, immediately provide it to the incident commander and all appropriate response agencies and departments. The NTSB also recommends that CCEMA update its Emergency Operations Plan, Hazardous Materials Response Plan, and Hazard Mitigation Plan, as appropriate, with lessons learned from the East Palestine derailment and fire, including, at a minimum, coordination among response agencies, communications, requests for and distribution of the train consist, staging and availability of equipment and other resources, and training for emergency responders.

The NTSB has investigated other accidents involving consist availability, including the July 10, 2005, collision and derailment of two Canadian National Railway Company freight trains in Anding, Mississippi, that resulted in four train crewmember fatalities, the release of 15,000 gallons of diesel fuel that burned for about 15 hours, and the evacuation of 100 residents (NTSB 2007). Seven tank cars containing hazardous materials residue derailed. The NTSB found that the railroad did not have the capability to provide first responders with consist information for one of the trains after the on-board copy was destroyed, and that this prevented emergency responders from promptly identifying the hazardous materials involved. The NTSB recommended that PHMSA: With the assistance of the Federal Railroad Administration, require that railroads immediately provide to emergency responders accurate, real-time information regarding the identity and location of all hazardous materials on a train. (R-07-4) 129

On January 22, 2008, in a response to Safety Recommendation R-07-4, PHMSA indicated to the NTSB that it was examining (1) ways to improve the availability of accurate and immediate information for emergency responders on the scene of an accident and (2) strategies for enhancing emergency response planning and training efforts. Additionally, PHMSA indicated that it was evaluating the emergency response issues raised in the safety recommendation and the federal, state, and local government and industry programs intended to address those issues. Based on PHMSA's communications, the NTSB classified Safety Recommendation R-07-4 Open—Acceptable Response.

On March 2, 2012, we reiterated Safety Recommendation R-07-4 as a result of our investigation of the June 19, 2009, derailment of a Canadian National Railway Company ethanol unit train in Cherry Valley, Illinois (NTSB 2012b).<sup>130</sup> Our investigation determined that the original consist for the train had only 3 of the 76 cars in their proper positions. Because this was a unit train, all loaded tank cars were transporting ethanol. We found that: The inaccurate train consist carried by the crew did not affect the emergency response to this accident; however, had a mixture of hazardous commodities been involved, the inaccurate consist information could have hampered the response effort or put the safety of emergency responders and others at risk. (NTSB 2012b)

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# Recommendation Report

2/3/2025 10:29:32 AM

In our investigation of the Paulsboro derailment, we determined that the train consist and ERI were not provided to the incident command for more than 3 hours (NTSB 2014c). In our investigative report, we found that: During the early hours following the accident, Consolidated Rail Corporation personnel did not immediately provide critical hazardous materials information to emergency responders that could have assisted in executing a safer response to this accident. (NTSB 2014c).

We therefore reiterated Safety Recommendation R-07-4. In our August 26, 2014, letter to PHMSA, we noted that we believed available technologies could and should be used to supplement the paper-based train consist for improving the dissemination of chemical hazard information to emergency responders.

On May 23, 2023, we sent a letter to PHMSA regarding the lack of an NPRM or final rule requiring real-time consist notifications and observing that other than a January 19, 2017, advance notice of proposed rulemaking that had not led to a final rule, PHMSA had not taken action to address Safety Recommendation R-07-4 (82 Fed. Reg. 6451). We therefore classified Safety Recommendation R-07-4 Open—Unacceptable Response.

On June 27, 2023, partially in response to this safety recommendation and following the East Palestine derailment, PHMSA issued an NPRM titled “Hazardous Materials: FAST Act Requirements for Real-Time Train Consist Information,” proposing amendments to its rules for hazard communication. The proposed rule would require Class I railroads to promptly provide consist information to nearby emergency responders in the event of a release or suspected release of hazardous materials.

On August 23, 2023, the NTSB commented on the proposed rule. 131 While pleased to see this NPRM, we noted three concerns: the proposed rule does not define “promptly”; notification depends on “the release or suspected release” of hazardous materials, not only an accident or incident involving a train carrying hazardous materials; and one version of the proposed rule would apply only to Class I railroads. Waiting to determine whether a release is “suspected” rather than merely possible could slow consist notification. Further, non-Class I railroads can experience hazardous materials releases. For example, the NTSB investigated a release involving a Class II railroad in June 2023 in Reed Point, Montana, when a Montana Rail Link freight train derailed 15 hazardous materials tank cars and released hazardous materials (molten sulfur and asphalt petroleum liquid) into the Yellowstone River.

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We recognize that PHMSA has addressed the concerns we identified in our NPRM comments by creating a final rule that requires immediate consist notification following an accident, addresses all rail accidents involving hazardous materials trains that affect local response agencies, and applies to all railroads that transport hazardous materials. The NTSB concludes that PHMSA’s Hazardous Materials: FAST Act Requirements for Real-Time Train Consist Information addresses the safety concerns of Safety Recommendation R-07-4. The NTSB therefore classifies Safety Recommendation R-07-4 as Closed—Acceptable Action.

|          |           |                         |       |
|----------|-----------|-------------------------|-------|
| 08/23/24 | Addressee | Official Correspondence | 73663 |
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# Recommendation Report

2/3/2025 10:29:32 AM

-From Peggy Clark, Director, Columbiana County Emergency Management Agency: The Columbiana County Emergency Management Agency ("CCEMA") is in receipt of your letter dated July 12, 2024.

As you may be aware, the Columbiana County Emergency Operations Plan addresses hazardous materials in Annex N Hazardous Materials and Right to Know. The content of Annex N is based upon requirements according to Section 3750.04(8) of the Ohio Revised Code (ORC). This Plan is reviewed annually by the State Emergency Response Commission. The Plan was last reviewed and met all of the requirements of the ORC in October of 2023.

CCEMA has reviewed the recommendations made by the National Transportation Safety Board ("NTSB"), and has amended Annex N to address the recommendations made by the National Transportation Safety Board (NTSB). Nevertheless, most of Annex N's content continues to be recommendations to response agencies, as CC EMA has no legal authority under Ohio Law to require response agencies to comply.

In reference to (R-24-17) wherein NTSB recommends CC EMA "Adopt a policy to, upon receipt of a train consist, immediately provide it to the incident commander and all appropriate response agencies and departments."

CCEMA disagrees with NTSB's assertion that there was a delay in supplying the consist to the incident command post. The consist was received at 10:01 p.m. Director Clark immediately made the consist available on her laptop to all response chiefs present and the initial Norfolk Southern (NS) employee on site. This information was also immediately relayed to Deputy Chief Gorby by phone via a NS employee as he had stepped away. Hazmat Chief Jones, after reviewing the consist electronically, requested that Director Clark forward the consist to him via email so he could print paper copies from his response unit. Director Clark emailed the document, and it was received by Chief Jones at 10:23 PM.

Please see the attached statement from Chief Jones in reference to this time frame. In addition, testimony from Beaver County Hazmat Chief Brewer (page 12 lines 1-4) discusses having access to the consist on a laptop in the command post. Director Clark and Chief Drabick requested a meeting to clarify these events with NTSB staff on 6/27 /24. The NTSB staff that were invited to the meeting were T. Lloyd, R. Payan, and P. Warren. Director Clark and Chief Drabick were also present.

Nevertheless, CC EMA has included language to Annex N that states if CC EMA obtains a train consist it will immediately be provided to incident command.



# Recommendation Report

2/3/2025 10:29:32 AM

**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

**Recommendation # :** R-24-018 **Overall Status:** Open - Initial Response Received CLASS II

TO THE COLUMBIANA COUNTY EMERGENCY MANAGEMENT AGENCY: Update your Emergency Operations Plan, Hazardous Materials Response Plan, and Hazard Mitigation Plan, as appropriate, with lessons learned from the East Palestine derailment and fire, including, at a minimum, coordination among response agencies, communications, requests for and distribution of the train consist, staging and availability of equipment and other resources, and training for emergency responders.

**# of Addressees:** 1 **Overall Date Closed:** N/A

**Addressee:** State of Ohio, County of Columbiana, Emergency Management Agency **Open - Initial Response Received** **Date Closed:** N/A

**07/12/24** NTSB Transmittal Letter 73264

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 cause 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 any accident or event investigated by the agency. 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 attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-017 and R-24-018). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.



# Recommendation Report

2/3/2025 10:29:32 AM

All communications regarding safety recommendations will be stored by the NTSB and viewable by the public. Please do not send privileged or confidential communications in response to this recommendation. Responses marked as confidential or privileged (or similar designations) will be considered nonresponsive. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov).

The National Transportation Safety Board (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.

We are providing the following information to urge the Columbiana County Emergency Management Agency to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Columbiana County Emergency Management Agency. Additional information regarding these recommendations can be found in the noted sections of the report.

- Adopt a policy to, upon receipt of a train consist, immediately provide it to the incident commander and all appropriate response agencies and departments. (R-24-17) (See section 2.3.2.)
- Update your Emergency Operations Plan, Hazardous Materials Response Plan, and Hazard Mitigation Plan, as appropriate, with lessons learned from the East Palestine derailment and fire, including, at a minimum, coordination among response agencies,



# Recommendation Report

2/3/2025 10:29:32 AM

communications, requests for and distribution of the train consist, staging and availability of equipment and other resources, and training for emergency responders. (R-24-18) (See section 2.3.2.)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-17 and -18). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.3.2 Communication and Consist Information

The NS Cleveland East dispatcher confirmed that the crew of train 32N had experienced an emergency about 8:56 p.m. Emergency responders made their first request for consist information about 9:04 p.m. by calling the NS dispatch center in Atlanta, Georgia, which did not provide the requested information at that time. Consist information did not reach emergency responders until shortly before 10:00 p.m., when the NS regional hazardous materials manager emailed the consist to the CCEMA director while driving to the scene. About the same time, phone calls were taking place between NS personnel, the EPFD fire chief, and the incident commander. Through these calls, the incident commander became aware of two hazardous materials in the consist: benzene and VCM. After 10:00 p.m., consist information spread piecemeal through responding agencies and personnel. In interviews with the NTSB, emergency responders reported issues with radio interoperability and characterized the overall incident command as fractured or chaotic. Not until about 11:00 p.m., at the recommendation of the Ohio State Patrol, did the EPFD deputy fire chief, acting as the incident commander, issue a 1-mile evacuation—the distance recommended by the 2020 ERG for fires involving tank cars transporting VCM or isobutylene. 127 About the same time, NS personnel and contractors began arriving on the scene and recommending that firefighters redeploy to safer distances. Firefighters suspended fire suppression activities and relocated to safer positions around midnight on February 4. As part of the movement to safer locations, the deputy fire chief moved the command post to the combined police and fire station about a mile from the derailment site.

The emergency response effort involved many agencies from multiple jurisdictions and three states. The two hazardous materials teams dispatched to the scene—the East Liverpool and Beaver County teams—were unable to establish radio communications with the incident commander or other EPFD personnel, and concerns about radio communication led the Beaver County director of emergency services to share hazardous materials information with Beaver County fire departments directly in the expectation that radio issues might otherwise prevent them from receiving that information. The East Liverpool fire chief addressed the lack of radio interoperability by assigning personnel from his own team to stay in the command post so that his radio communications could reach other personnel stationed there.

These approaches to overcoming lack of interoperability reflect ingenuity and awareness of risk in the face of a challenging situation. However, reliance on face-to-face communications and lack of common channels to support interoperability reduce the efficiency of information sharing. The NTSB concludes that because there were not common radio channels between all responding agencies, the emergency response lacked efficient coordination.

Interoperability is a goal set by the 2019 NECP, the national roadmap for ensuring effective communications under NIMS. The standards and methods described in the 2019 NECP and integrated into the overall NIMS doctrine remain the preferred approach to ensuring efficient, effective communication between emergency responders, and the fundamentals of interoperability are addressed in the associated training courses. CISA maintains a regularly updated list of federal financial assistance programs intended to support investment in emergency communications.<sup>128</sup>



# Recommendation Report

2/3/2025 10:29:32 AM

The NTSB is concerned that complete and accurate consist information was not quickly and clearly communicated to the incident command after East Palestine dispatch contacted NS by phone and requested it. The slow provision of consist information to a single point of contact, followed by partial information provided over the phone to the incident commander, and then the slow distribution among responding agencies, delayed the evacuation to the ERG-recommended distance and protracted the time firefighters spent responding to an unknown set of hazards. Slow transmittal and distribution also delayed the Ohio State Patrol's recommendation to the incident commander that the shelter-in-place order be replaced by an evacuation, the response recommended in the 2020 ERG. The NTSB concludes that the delayed transmittal of consist information by NS to emergency responders needlessly increased the time emergency responders spent near the derailment pileup and delayed the evacuation order, resulting in unnecessary and increased exposure of emergency responders and the public to postderailment hazards.

In response to this accident, NS began integrating its emergency response notification process with RapidSOS, a digital platform designed to provide emergency responders with real-time consist information and notify NS of 911 calls reporting track emergencies in NS's rail network. This change is intended to make consist information available to first responders sooner and allow NS to begin responding to emergencies as soon as 911 calls are made. However, these changes may not address the specific problem present at East Palestine: an incoming request for information from a dispatch center remaining unanswered. The NTSB recommends that NS review and revise its procedures to immediately provide emergency responders with an accurate copy of the train consist upon becoming aware of an accident. The NTSB recommends that CCEMA adopt a policy to, upon receipt of a train consist, immediately provide it to the incident commander and all appropriate response agencies and departments. The NTSB also recommends that CCEMA update its Emergency Operations Plan, Hazardous Materials Response Plan, and Hazard Mitigation Plan, as appropriate, with lessons learned from the East Palestine derailment and fire, including, at a minimum, coordination among response agencies, communications, requests for and distribution of the train consist, staging and availability of equipment and other resources, and training for emergency responders.

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# Recommendation Report

2/3/2025 10:29:32 AM

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We recognize that PHMSA has addressed the concerns we identified in our NPRM comments by creating a final rule that requires immediate consist notification following an accident, addresses all rail accidents involving hazardous materials trains that affect local response agencies, and applies to all railroads that transport hazardous materials. The NTSB concludes that PHMSA’s Hazardous Materials: FAST Act Requirements for Real-Time Train Consist Information addresses the safety concerns of Safety Recommendation R-07-4. The NTSB therefore classifies Safety Recommendation R-07-4 as Closed—Acceptable Action.

08/23/24

Addressee

Official Correspondence

73663



# Recommendation Report

2/3/2025 10:29:32 AM

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CCEMA has added additional language to Annex N to make recommendations to response agencies that include:

- Ensuring that mutual aid agreements are in place and up to date to aid in coordination
- Developing and exercising communication plans with mutual aid agencies
- Recommendations on existing interoperable radio frequencies
- Outlining the new requirements for railroads to proactively provide the consist to the appropriate Public Safety Answering Points (PSAP)
- Recommending that PSAPs have policies in place to deliver the consist to incident command
- Stating that if EMA obtains a consist it will be immediately provided to incident command
- Recommending that the IC establish the command post outside of the hot zone
- Recommending that the IC establish a designated staging area where incoming units would be directed
- Recommending that ICS be followed, and a Communication Unit Leader be designated to develop and manage communication plans

The following recommendations for first responder training already exist in Annex N:

- The minimum level of training for emergency response personnel, Fire, EMS, Law Enforcement, Health Department, and Hospital staff includes:
  - o Hazmat Awareness and Operations
  - o Incident Command Training of ICS 100,200,700 and 800
- In addition to the minimum training, it is recommended that Chiefs and administrators be also certified at the Advanced ICS Training of ICS 300 and 400

CCEMA/LEPC routinely coordinates and covers the costs of bringing training to Columbiana County. Additionally, CC EMA coordinated with Norfolk Southern to provide an exercise for first responders to respond to a derailment with a hazardous materials release as recent as 4 months before the East Palestine incident.

Please feel free to contact me with any questions or concerns.



# Recommendation Report

2/3/2025 10:29:32 AM

**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                         |                                   |                                  |                                  |          |
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| <b>Recommendation # :</b>                                                                                                                                                                                               | R-24-019                          | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO THE ASSOCIATION OF AMERICAN RAILROADS: Develop a database of bearing failures and replacements and make it available to railroads, regulators, and investigators to help determine and address failure risk factors. |                                   |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                 | 1                                 |                                  | <b>Overall Date Closed:</b>      | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                       | Association of American Railroads | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |

**07/12/24** NTSB Transmittal Letter 73264

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 cause 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 any accident or event investigated by the agency. 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 attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-019 and R-24-021). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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similar designations) will be considered nonresponsive. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov).

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We are providing the following information to urge the Association of American Railroads to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment ;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Association of American Railroads. Additional information regarding these recommendations can be found in the noted sections of the report.

- Develop a database of bearing failures and replacements and make it available to railroads, regulators, and investigators to help determine and address failure risk factors. (R-24-19) (See section 2.2.5.)
- Revise the Manual of Standards and Recommended Practices, M 1002, Specifications for Tank Cars, to establish criteria and procedures for manufacturers of tank car service equipment to demonstrate compatibility of pressure relief devices and other Association of American Railroads approved service equipment with intended ladings. (R-24-20) (See section 2.4.3.1.)



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- Revise the definition of key train in Circular OT-55 to designate as a key train any train containing tank cars transporting hazardous materials that do not meet the DOT-117 standard. (R-24-21) (See section 2.4.5.)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-19 through -21). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.2.5 Accident Bearing Failure Analysis

Railcar bearings can fail in several ways. Research has found that age-related bearing failures are the most common and can result from spalling, uneven loading, and lubrication breakdown, while the rarer non-age-related failures typically result from loose components, high loading, and water ingress (Iwand 2021).

However, damage to the recovered components of the L1 bearing was too severe to allow laboratory determination of why the bearing burned off. Any traces of fatigue, loose components, loss of lubrication, water ingress, or other root causes that can eventually lead to bearing failure were erased by the high temperatures of the burn-off and subsequent fire exposure. While meteorological and CLM records indicate that the hopper car was subjected to severe weather in 2016 and 2017—including significant rainfall from Hurricane Harvey—the bearing continued in service for more than 5 years after Hurricane Harvey, and there is no evidence of the bearing showing signs of failure before the derailment sequence described in this report. The available evidence does not indicate that the bearing failed as a result of water ingress or a weather event, and the root cause of the bearing's failure remains unclear.

Lack of usable physical evidence following bearing burn-off is not an isolated problem. The NTSB also recovered burned-off bearing components during our investigation of the New Castle and Elliston derailments and found that both failed bearings had been reconditioned, but the components were too severely damaged to support laboratory determination of why either bearing burned off. The NTSB's investigations into the East Palestine, New Castle, and Elliston derailments all encountered the same general issue: a bearing failure significant enough to lead to an accident tends to destroy the evidence of its underlying cause. Testing has found that a bearing failure can happen rapidly; a bearing can go from below an alarm temperature to seized (no longer able to rotate as designed) in less than a minute (Leedham 1992). The accompanying increase in temperature is rapid enough that it is unlikely to be arrested in time to preserve useful forensic evidence about underlying causes even if the overheated bearing is detected and removed from service. Damaged bearings that remain in service long enough to burn off and cause a derailment are subjected to even more heat and friction. Examination of individual bearings after bearing-related accidents is unlikely to provide useful information about preventing or predicting bearing failures.

Lacking physical evidence from the bearings sufficient to determine why these three specific bearings burned off, the NTSB attempted to explore common factors across all three bearings: all were on freight cars, all were on lead axles, and all had been reconditioned. To establish a baseline for whether these factors influence bearing failure rates, a railroad, investigator, or regulator would need access to a database of detailed railcar bearing statistics. However, there is no current database that records bearing manufacturer, railcar type, mileage at failure, bearing position, new or reconditioned status, service type, and other factors that could plausibly affect bearing performance. Such a database would support efforts to identify trends in bearing failure and underlying commonalities. For example, a group of representatives of federal and state regulatory agencies and the natural gas and plastic pipe industries created



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The Plastic Pipe Database Committee, which maintains a database on the performance of plastic piping materials. The database is administered by the American Gas Association and is intended to support understanding of leak frequency and causes by collecting as much information as possible from a representative cross-section of the natural gas industry (Plastic Pipe Data Collection Committee 2015).

The NTSB is concerned that in the absence of comparable bearing data from across the rail industry, railroads, investigators, and regulators lack statistical baselines to help sort causally relevant factors from irrelevant ones. For example, all three burned-off bearings in the East Palestine, New Castle, and Elliston derailments were reconditioned. However, thousands of reconditioned railcar bearings operate without incident every day. Without additional information, railroads, investigators, and regulators cannot reliably identify factors of interest.

The practical difficulties of obtaining useful physical evidence from individual destroyed bearings invite two approaches to gathering more information about causes of bearing failure. First, consistent and detailed collection of information about bearings involved in accidents would, over time, allow investigators to identify common factors disproportionately represented in accident bearing failures (certain types of railcars or service, reconditioning, and maintenance intervals are plausible possibilities). Second, bearings replaced as part of scheduled maintenance or in response to early defect detection (such as by ABDs) provide opportunities to collect physical evidence or record background information regarding risk factors for unusual deterioration that could cause a bearing to fail sooner than expected. The NTSB concludes that a database capturing bearing failure and replacement information could help identify what factors pose an increased risk of burn-off so that railroads, regulators, and investigators can better address bearing-related safety issues. The AAR already maintains a database of railcar billing records, which includes information about bearing replacements and supports industry research about bearing defects and defect detection. This database provides a starting point and potential model for future efforts. The NTSB recommends that the AAR develop a database of bearing failures and replacements and make it available to railroads, regulators, and investigators to help determine and address failure risk factors.

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| 10/24/24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Addressee | Official Correspondence | 73895 |
| <p>-From Ian N. Jefferies, President and CEO: For over a decade, when a shop puts a new wheelset on a rail car, that information is placed in AAR's Umler system. The wheelset information contains information on the bearings associated with the wheelset. Thus, AAR believes Umler is the appropriate database of bearing replacements recommended by NTSB.</p> <p>Regarding failures, AAR's Wheels, Axles, Bearings, and Lubrication (WABL) Committee tracks failures. Approximately 25 percent of failed bearings are torn down and reports of the findings are sent to WABL. A technical advisory group is tasked with the responsibility to review the findings and make recommendations to the full Committee.</p> <p>WABL meetings are open to the Federal Railroad Administration (FRA). WABL staff formerly prepared a presentation on the data from the bearing tear-down reports, but that practice was discontinued approximately five years ago. WABL has reinstituted the presentations on a semiannual basis. AAR will forward the presentations to FRA regardless of whether FRA attends the WABL meeting at which the presentations are made.</p> |           |                         |       |



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

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| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                                                                             | R-24-020                          | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO THE ASSOCIATION OF AMERICAN RAILROADS: Revise the Manual of Standards and Recommended Practices, M 1002, Specifications for Tank Cars, to establish criteria and procedures for manufacturers of tank car service equipment to demonstrate compatibility of pressure relief devices and other Association of American Railroads-approved service equipment with intended loadings. |                                   |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                                                                               | 1                                 |                                  | <b>Overall Date Closed:</b>      | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                                                                                                                                     | Association of American Railroads | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |

**07/12/24** NTSB Transmittal Letter 73264

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The attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.ntsbt.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

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As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment ;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
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Accordingly, the NTSB makes the following safety recommendations to the Association of American Railroads. Additional information regarding these recommendations can be found in the noted sections of the report.

- Develop a database of bearing failures and replacements and make it available to railroads, regulators, and investigators to help determine and address failure risk factors. (R-24-19) (See section 2.2.5.)
- Revise the Manual of Standards and Recommended Practices, M 1002, Specifications for Tank Cars, to establish criteria and procedures for manufacturers of tank car service equipment to demonstrate compatibility of pressure relief devices and other Association of American Railroads approved service equipment with intended ladings. (R-24-20) (See section 2.4.3.1.)



# Recommendation Report

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- Revise the definition of key train in Circular OT-55 to designate as a key train any train containing tank cars transporting hazardous materials that do not meet the DOT-117 standard. (R-24-21) (See section 2.4.5.)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-19 through -21). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.4.3.1 Tank Car and Fittings Certification

Under 49 CFR 179.5, a tank car must have a certificate of construction before entering service. Under 49 CFR 179.3, applications for approval of designs, materials of construction, conversion, or alteration of tank car tanks, complete with detailed prints, must be considered and approved by the AAR Tank Car Committee or other appropriate committees before a certificate of construction can be issued. Applicants must specify commodities and certify that the tank car and its service equipment (such as PRDs) are compatible with the specified lading as described in the AAR MSRP, M-1002, Specifications for Tank Cars. The AAR also approves PRD designs through a separate process, which asks the applicant to specify the commodity with which the PRD will be used. Applicants must test a PRD's flow rate using a test fluid such as steam, air, or natural gas. The AAR approval processes for tank cars and PRDs do not include independent evaluation of whether an applicant's certification of compatibility is accurate.

Four of the five derailed VCM tank cars were certified for "vinyl chloride." The fifth, GATX95098, was certified for "propylene oxide and products authorized in DOT 173 [sic] for which there are no special commodity requirements and nonregulated commodities compatible with this class of car." VCM is a Division 2.1 flammable gas and is therefore subject to the special requirements of 49 CFR 173.314(j). However, the NTSB did not identify evidence that the tank car did not meet these requirements or that its original lading certification materially affected its suitability for use in VCM service or created a specific safety risk.

The certificates of construction for three of the VCM tank cars reference design drawings that specify aluminum components: for TILX402025, the version of a PRD with an aluminum-coated spring, and for OCPX80235 and OCPX80179, an aluminum protective housing cover. The NTSB's postderailment examinations of the VCM tank cars also identified aluminum valve handwheels on tank car OCPX80370.

The Oxy Vinyls SDS for VCM lists aluminum as incompatible with VCM because it may result in violently exothermic (heat-producing) reactions. While expert testimony at the NTSB Investigative Hearing called into question the scientific basis for this incompatibility warning, the NTSB is concerned that tank cars certified for VCM service had protective housing covers, valve handwheels, and PRD components made of a material specifically described as incompatible by the lading's SDS.<sup>145</sup> There is no evidence that the AAR Tank Car Committee or any third-party approver took note of this incompatibility or raised concerns, and the five derailed tank cars transporting VCM were in service with aluminum components.

The current approval process for certificates of construction depends on the accuracy of manufacturers' own representations of their products' compatibility with ladings and compliance with regulations. The AAR does not appear to consistently verify these representations through independent testing, reference to relevant scientific literature, or demonstration. The AAR's approval process was insufficient to prevent the VCM tank cars involved in the East Palestine derailment from being certified despite the possible



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incompatibility of fittings with the specified lading. The NTSB concludes that the current AAR tank car certificate of construction approval process lacks a means of verifying manufacturers' claims and is therefore insufficient to ensure that tank cars and their fittings are appropriate for their specified lading. The AAR's current review process cannot reliably identify tank cars whose fittings may be incompatible with the specified lading, creating safety hazards that could be avoided by more careful review, appropriate testing, or use of SDSs and other sources of hazard information. The NTSB recommends that the AAR revise the MSRP, M-1002, Specifications for Tank Cars, to establish criteria and procedures for manufacturers of tank car service equipment to demonstrate compatibility of PRDs and other AAR-approved service equipment with intended ladings. The NTSB also recommends that the FRA monitor the progress of the AAR's action on R-24-20 and use its regulatory authority to ensure that the AAR addresses weaknesses in its tank car service equipment approval process.

|                                                                                                                                                                                                                                                                                                                                                                        |           |                         |       |
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| 10/24/24                                                                                                                                                                                                                                                                                                                                                               | Addressee | Official Correspondence | 73895 |
| -From Ian N. Jefferies, President and CEO: Department of Transportation regulations require that service equipment be compatible with the lading (49 C.F.R. sections 179.15 and 179.100-13). As NTSB recommends, AAR's Tank Car Committee is developing a requirement that manufacturers actually demonstrate compatibility, for inclusion in the Manual of Standards. |           |                         |       |



# Recommendation Report

2/3/2025 10:29:33 AM

**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                         | R-24-021 | <b>Overall Status:</b> | Open - Initial Response Received | CLASS II |
| TO THE ASSOCIATION OF AMERICAN RAILROADS: Revise the definition of key train in Circular OT-55 to designate as a key train any train containing tank cars transporting hazardous materials that do not meet the DOT-117 standard. |          |                        |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                           | 1        |                        | <b>Overall Date Closed:</b>      | N/A      |

|                   |                                   |                                  |                     |     |
|-------------------|-----------------------------------|----------------------------------|---------------------|-----|
| <b>Addressee:</b> | Association of American Railroads | Open - Initial Response Received | <b>Date Closed:</b> | N/A |
|-------------------|-----------------------------------|----------------------------------|---------------------|-----|

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|-----------------|------|--------------------|-------|
| <b>07/12/24</b> | NTSB | Transmittal Letter | 73264 |
|-----------------|------|--------------------|-------|

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The attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-019 and R-24-021). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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# Recommendation Report

2/3/2025 10:29:33 AM

ExecutiveSecretariat@ntsb.gov.

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We are providing the following information to urge the Association of American Railroads to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment ;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the Association of American Railroads. Additional information regarding these recommendations can be found in the noted sections of the report.

- Develop a database of bearing failures and replacements and make it available to railroads, regulators, and investigators to help determine and address failure risk factors. (R-24-19) (See section 2.2.5.)
- Revise the Manual of Standards and Recommended Practices, M 1002, Specifications for Tank Cars, to establish criteria and procedures for manufacturers of tank car service equipment to demonstrate compatibility of pressure relief devices and other Association of American Railroads approved service equipment with intended loadings. (R-24-20) (See section 2.4.3.1.)



# Recommendation Report

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- Revise the definition of key train in Circular OT-55 to designate as a key train any train containing tank cars transporting hazardous materials that do not meet the DOT-117 standard. (R-24-21) (See section 2.4.5.)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-19 through -21). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.4.5 Key Trains

The definition of key train in AAR Circular OT-55 includes a threshold of 20 car loads of hazardous materials, or a single car load of especially hazardous materials such as spent nuclear fuel, and a train that meets either threshold is subject to recommended practices for maximum speeds and additional procedures for defective bearings. In setting these two thresholds, the definition reflects different levels of lading hazards. However, it does not distinguish between tank cars with different probabilities of releasing hazardous materials during an accident. As discussed above in section 2.4.2.2, the DOT-111 specification, and by extension the similar AAR-211 specification, are generally less survivable than tank cars that meet the DOT-117 standard. A simple tank car count therefore does not provide an accurate representation of how hazardous a train is; the specifications of the tank cars transporting hazardous materials are also relevant to the assessment. The NTSB concludes that the definition of key train in AAR Circular OT-55 does not account for differences in survivability between different tank car specifications, and the DOT-111 and AAR-211 specifications can pose an elevated risk of a hazardous materials release compared to other specifications, such as the DOT-117. The NTSB recommends that the AAR revise the definition of key train in Circular OT-55 to designate as a key train any train containing tank cars transporting hazardous materials that do not meet the DOT-117 standard.

| 10/24/24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Addressee | Official Correspondence | 73895 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|-------|
| -From Ian N. Jefferies, President and CEO: AAR has consistently supported a phase out of DOT-111 tank cars for flammable liquid service, as soon as practicable. AAR's members also have voluntarily adopted the restrictions in OT-55 and expanded the applicability of those restrictions, when appropriate, and will continue to do so in the future.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |                         |       |
| At the same time, AAR does not agree with applying OT-55 to all trains transporting a DOT-111 tank car containing a hazardous material. Such a change would result in a vast increase in the number of trains subject to OT-55. In some regions, upwards of 90 percent of trains would be key trains. For some Class I railroads, the number of key trains would more than triple, for some railroads approaching half the trains they operate. Subjecting such large percentages of trains to the OT-55 operating restrictions would have a significant adverse effect on the fluidity of the railroad network and the ability of railroads to compete successfully for traffic. That would not be in the public interest. Notably, no risk calculation has been performed justifying such drastic action. |           |                         |       |
| It also should be noted that a DOT-117 tank car is not appropriate for all commodities. For example, DOT-117 tank cars have jackets and thus are inappropriate for transporting corrosive materials. Thermal protection is also unnecessary for acids with a very high boiling point.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |                         |       |
| Thank you for the opportunity to comment on the status of recommendations directed at AAR. We look forward to continuing a productive and collaborative relationship grounded in improving safety.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |           |                         |       |



# Recommendation Report

2/3/2025 10:29:33 AM

**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                                                                                                                                           |                                 |                        |                             |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------|-----------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                                                                 | R-24-022                        | <b>Overall Status:</b> | Open - Await Response       | CLASS II |
| TO THE NATIONAL VOLUNTEER FIRE COUNCIL: Identify barriers to adequate fire and emergency response training for volunteer firefighters, particularly for situations where hazardous materials are present, and publish actions states, municipalities, and the private sector can take to provide the flexibility necessary for volunteer firefighters to obtain training. |                                 |                        |                             |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                                                                   | 1                               |                        | <b>Overall Date Closed:</b> | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                                                                                                                         | National Volunteer Fire Council | Open - Await Response  | <b>Date Closed:</b>         | N/A      |
| <b>07/12/24</b>                                                                                                                                                                                                                                                                                                                                                           | NTSB                            | Transmittal Letter     | 73264                       |          |

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The attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-022, R-24-023, and R-24-024). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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# Recommendation Report

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We are providing the following information to urge the National Volunteer Fire Council to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the National Volunteer Fire Council. Additional information regarding these recommendations can be found in the noted sections of the report.

- Identify barriers to adequate fire and emergency response training for volunteer firefighters, particularly for situations where hazardous materials are present, and publish actions states, municipalities, and the private sector can take to provide the flexibility necessary for volunteer firefighters to obtain training. (R-24-22) (See section 2.3.1.)
- Advise your members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs. (R-24-23) (See section 2.3.1.)
- Advise your members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate. (R-24-24) (See section 2.5.4.)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would



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appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-22 through -24). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.3.1 Initial Deployment of Firefighters

The EPFD responded to 911 calls and reached the accident scene within 10 minutes of the derailment. During this stage of the emergency response, EPFD firefighters did not have access to the consist of train 32N but had observed tank cars among the derailed and burning equipment. The applicable guidance from the 2020 ERG was the "Mixed Load / Unidentified Cargo" entry for a fire involving tank cars, which advised a half-mile (or 2,640-foot) preliminary isolation and evacuation of the scene, noted the need for self-contained breathing apparatuses, and cautioned that materials may react violently with extinguishing agents, including water (PHMSA 2020). The entry recommended the use of water to cool containers but cautions against allowing water to enter those containers.

The EPFD deputy fire chief set up a command post at a business about 400 feet from the burning train, more than 2,000 feet inside the ERG-recommended isolation and evacuation zone. Without referencing the 2020 ERG, volunteer firefighters approached the pileup and began applying water to contain the fire, which grew rapidly. Firefighters were equipped with self-contained breathing apparatuses, but without more information about the train's consist, the incident commander had no way of determining whether this personal protective equipment was adequate for operations within the half-mile isolation zone. The NTSB concludes that, while the EPFD deputy fire chief and other volunteer firefighters acted in good faith to protect their community, the initial emergency response did not conform to ERG guidance for fires involving tank cars and unknown materials; both the proximity of the first command post to the fire and the use of manned hoses near a fire involving unknown materials placed these firefighters at unnecessary risk.

Pre-certification volunteer firefighter training in Ohio is limited by statute under State of Ohio Revised Code Section 4765.55. A training course for a Volunteer Firefighter certificate may not exceed 36 hours. According to guidance distributed by Ohio EMS, the foundational volunteer firefighter course does not permit participation in training involving hazardous environments because of this time constraint (Ohio EMS 2023). The basic 36-hour training course does not meet the NFPA 1010 standard for professional firefighters (or the NFPA 1001 standard in place at the time of the derailment), which requires a minimum of 160 hours of training and includes job performance requirements not addressed in the volunteer course. Fire chiefs or authorities having jurisdiction are responsible for providing additional training for volunteer firefighters expected to operate in hazardous environments. However, the statute does not specify minimum standards, specific courses, or demonstration of skills or knowledge to ensure that additional training adequately prepares firefighters for hazardous environments. The EPFD deputy fire chief had completed two additional courses in hazardous materials awareness and operations in 2022, but the response in East Palestine still deviated from recommended practices by placing firefighters near burning tank cars and establishing a command post a few hundred feet from a fire involving unknown hazardous materials.

Statutory requirements and training courses for professional firefighters in Ohio meet the relevant NFPA 1010 standard. However, the NTSB is concerned that volunteer fire departments in the state of Ohio are called on to respond to the same incidents as their professional counterparts, as seen in this accident, but that volunteers may have only a fraction of the training Ohio requires for professional firefighters: 36 hours instead of at least 160 hours. Further, the Ohio statute significantly limits initial training for volunteers and has resulted in a prohibition on training in hazardous environments. While the statute instructs local authorities to provide additional training, it establishes no clear requirements or guidance on what additional training is appropriate. The EPFD personnel who responded to the derailment and fire had varying training levels related to hazardous materials that ranged from no training at all to technician-level training, but the NTSB has not found evidence that their roles in the initial emergency response were



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tailored to their individual training levels. The NTSB concludes that the state of Ohio's statutory requirements for volunteer firefighter training were insufficient to support a safe emergency response to the East Palestine derailment led by a volunteer fire department. Therefore, the NTSB recommends that the state of Ohio amend its firefighter training statute and revise its volunteer firefighter certification standards to meet the NFPA 1010 standard for professional firefighters.

The National Volunteer Fire Council (NVFC) represents the interests of the volunteer fire, EMS, and rescue services. The International Association of Fire Chiefs (IAFC) represents the interests of emergency responders with a focus on leaders. The International Association of Fire Fighters (IAFF) is a labor union representing firefighters, emergency medical workers, and rescue workers in the United States and Canada.<sup>126</sup> These organizations provide resources, programs, education, and advocacy for emergency responders and are positioned to encourage adoption of standards to protect their members' safety, including identifying trainings and sources of funding. Thus, the NTSB recommends that the NVFC, IAFC, and IAFF advise their members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs. The NTSB also recommends that the NVFC identify barriers to adequate fire and emergency response training for volunteer firefighters, particularly for situations where hazardous materials are present, and publish actions states, municipalities, and the private sector can take to provide the flexibility necessary for volunteer firefighters to obtain training.



# Recommendation Report

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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                           |          |                        |                                  |          |
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| <b>Recommendation # :</b> | R-24-023 | <b>Overall Status:</b> | Open - Initial Response Received | CLASS II |
|---------------------------|----------|------------------------|----------------------------------|----------|

TO THE INTERNATIONAL ASSOCIATION OF FIRE CHIEFS, THE INTERNATIONAL ASSOCIATION OF FIRE FIGHTERS, AND THE VOLUNTEER FIRE COUNCIL: Advise your members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs.

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| <b># of Addressees:</b> | 3 | <b>Overall Date Closed:</b> | N/A |
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|                   |                                          |                                  |                     |     |
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| <b>Addressee:</b> | International Association of Fire Chiefs | Open - Initial Response Received | <b>Date Closed:</b> | N/A |
|-------------------|------------------------------------------|----------------------------------|---------------------|-----|

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| <b>07/12/24</b> | NTSB | Transmittal Letter | 73264 |
|-----------------|------|--------------------|-------|

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# Recommendation Report

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We are providing the following information to urge the International Association of Fire Chiefs to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

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As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
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- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision;
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the International Association of Fire Chiefs. Additional information regarding these recommendations can be found in the noted sections of the report.

- Advise your members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs. (R-24-23) (See section 2.3.1.)
- Advise your members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate. (R-24-24) (See section 2.5.4.)

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# Recommendation Report

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and -24). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.3.1 Initial Deployment of Firefighters

The EPFD responded to 911 calls and reached the accident scene within 10 minutes of the derailment. During this stage of the emergency response, EPFD firefighters did not have access to the consist of train 32N but had observed tank cars among the derailed and burning equipment. The applicable guidance from the 2020 ERG was the "Mixed Load / Unidentified Cargo" entry for a fire involving tank cars, which advised a half-mile (or 2,640-foot) preliminary isolation and evacuation of the scene, noted the need for self-contained breathing apparatuses, and cautioned that materials may react violently with extinguishing agents, including water (PHMSA 2020). The entry recommended the use of water to cool containers but cautions against allowing water to enter those containers.

The EPFD deputy fire chief set up a command post at a business about 400 feet from the burning train, more than 2,000 feet inside the ERG-recommended isolation and evacuation zone. Without referencing the 2020 ERG, volunteer firefighters approached the pileup and began applying water to contain the fire, which grew rapidly. Firefighters were equipped with self-contained breathing apparatuses, but without more information about the train's consist, the incident commander had no way of determining whether this personal protective equipment was adequate for operations within the half-mile isolation zone. The NTSB concludes that, while the EPFD deputy fire chief and other volunteer firefighters acted in good faith to protect their community, the initial emergency response did not conform to ERG guidance for fires involving tank cars and unknown materials; both the proximity of the first command post to the fire and the use of manned hoses near a fire involving unknown materials placed these firefighters at unnecessary risk.

Pre-certification volunteer firefighter training in Ohio is limited by statute under State of Ohio Revised Code Section 4765.55. A training course for a Volunteer Firefighter certificate may not exceed 36 hours. According to guidance distributed by Ohio EMS, the foundational volunteer firefighter course does not permit participation in training involving hazardous environments because of this time constraint (Ohio EMS 2023). The basic 36-hour training course does not meet the NFPA 1010 standard for professional firefighters (or the NFPA 1001 standard in place at the time of the derailment), which requires a minimum of 160 hours of training and includes job performance requirements not addressed in the volunteer course. Fire chiefs or authorities having jurisdiction are responsible for providing additional training for volunteer firefighters expected to operate in hazardous environments. However, the statute does not specify minimum standards, specific courses, or demonstration of skills or knowledge to ensure that additional training adequately prepares firefighters for hazardous environments. The EPFD deputy fire chief had completed two additional courses in hazardous materials awareness and operations in 2022, but the response in East Palestine still deviated from recommended practices by placing firefighters near burning tank cars and establishing a command post a few hundred feet from a fire involving unknown hazardous materials.

Statutory requirements and training courses for professional firefighters in Ohio meet the relevant NFPA 1010 standard. However, the NTSB is concerned that volunteer fire departments in the state of Ohio are called on to respond to the same incidents as their professional counterparts, as seen in this accident, but that volunteers may have only a fraction of the training Ohio requires for professional firefighters: 36 hours instead of at least 160 hours. Further, the Ohio statute significantly limits initial training for volunteers and has resulted in a prohibition on training in hazardous environments. While the statute instructs local authorities to provide additional training, it establishes no clear requirements or guidance on what additional training is appropriate. The EPFD personnel who responded to the derailment and fire had varying training levels related to hazardous materials that ranged from no training at all to technician-level training, but the NTSB has not found evidence that their roles in the initial emergency response were tailored to their individual training levels. The NTSB concludes that the state of Ohio's statutory requirements for volunteer firefighter training were insufficient to support a safe emergency response to the East Palestine derailment led by a volunteer fire department.



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Therefore, the NTSB recommends that the state of Ohio amend its firefighter training statute and revise its volunteer firefighter certification standards to meet the NFPA 1010 standard for professional firefighters.

The National Volunteer Fire Council (NVFC) represents the interests of the volunteer fire, EMS, and rescue services. The International Association of Fire Chiefs (IAFC) represents the interests of emergency responders with a focus on leaders. The International Association of Fire Fighters (IAFF) is a labor union representing firefighters, emergency medical workers, and rescue workers in the United States and Canada.<sup>126</sup> These organizations provide resources, programs, education, and advocacy for emergency responders and are positioned to encourage adoption of standards to protect their members' safety, including identifying trainings and sources of funding. Thus, the NTSB recommends that the NVFC, IAFC, and IAFF advise their members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs. The NTSB also recommends that the NVFC identify barriers to adequate fire and emergency response training for volunteer firefighters, particularly for situations where hazardous materials are present, and publish actions states, municipalities, and the private sector can take to provide the flexibility necessary for volunteer firefighters to obtain training.

| 10/09/24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Addressee | Official Correspondence | 73829 |
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| <p>-From Fire Chief Josh Waldo, CFO, EFO, IAFC President and Board Chair 2024-2025: On behalf of the nearly 11,000 members of the International Association of Fire Chiefs (IAFC), I write this letter in response to the National Transportation Safety Board's (NTSB) safety recommendations R-24-23 and R-24-24. The IAFC is a 501(c)(3) organization that represents the leadership of America's fire and emergency service. For over 150 years, the IAFC has been at the forefront of advocating for increased safety on all modes of transportation. Working with our subject matter experts, we have developed the following plan on how best to respond to these safety recommendations. The IAFC believes that these actions will lead to increased safety for future railroad incidents.</p> <p>Below are the specific recommendations from the NTSB to the IAFC:</p> <ul style="list-style-type: none"><li>• Advise your members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs. (R-24-23)</li><li>• Advise your members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate. (R-24-24)</li></ul> <p>To best implement the safety recommendations, the IAFC formed a working group comprised of members of the IAFC Hazardous Materials (Hazmat) Committee. The IAFC Hazmat Committee is a collection of industry experts, who convene to review best practices for responses to hazardous materials incidents. The working group will develop the training materials requested by the NTSB and develop a survey of the IAFC membership -- as requested by the NTSB -- to determine how many firefighters are trained to the NFPA 1010, Standard on Professional Qualifications for Firefighters.</p> <p>Article on East Palestine Derailment: The IAFC Hazmat Committee's working group will draft an article for ICHIEFS, the IAFC electronic newsletter, and our website to discuss the lessons learned from the NTSB report about the East Palestine derailment.</p> <p>Survey on NFPA 1010: The IAFC Hazmat Committee's working group will draft questions for a survey to IAFC Membership about training to comply with the requirements of NFPA 1010.</p> <p>Resources on Best Practices, Grants, and Resources for NFPA 1010: The IAFC Hazmat Committee's working group will work with the IAFC Government Relations and Policy department to develop a list of best practices, grants, and resources for training to NFPA 1010.</p> <p>The IAFC will distribute the list of best practices, grants, and resources for training to NFPA 1010 through blog postings and social media. There may be a special focus on contacting fire departments that do not train NFPA 1010 compliance depending on feasibility.</p> <p>The IAFC also will update the IAFC Hazmat Fusion Center website (Hazmat Fusion Center (iafc.org)) to include best practices, grants, and resources for training to NFPA 1010.</p> |           |                         |       |



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| <b>Addressee:</b> | International Association of Fire Fighters | Open - Initial Response Received | <b>Date Closed:</b> | N/A |
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| <b>07/12/24</b> | NTSB | Transmittal Letter | 73264 |
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The attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-023 and R-24-024). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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We are providing the following information to urge the International Association of Fire Fighters to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

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As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;



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- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision;
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the International Association of Fire Fighters. Additional information regarding these recommendations can be found in the noted sections of the report.

- Advise your members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs. (R-24-23) (See section 2.3.1.)
- Advise your members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate. (R-24-24) (See section 2.5.4.)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-23 and -24). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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The EPFD deputy fire chief set up a command post at a business about 400 feet from the burning train, more than 2,000 feet inside the ERG-recommended isolation and evacuation zone. Without referencing the 2020 ERG, volunteer firefighters approached the pileup and began applying water to contain the fire, which grew rapidly. Firefighters were equipped with self-contained breathing apparatuses, but without more information about the train's consist, the incident commander had no way of determining whether this personal protective equipment was adequate for operations within the half-mile isolation zone. The NTSB concludes that, while the EPFD deputy fire chief and other volunteer firefighters acted in good faith to protect their community, the initial emergency response did not conform to ERG guidance for fires involving tank cars and unknown materials; both the proximity of the first command post to the fire and the use of manned hoses near a fire involving unknown materials placed these firefighters at unnecessary risk.



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Statutory requirements and training courses for professional firefighters in Ohio meet the relevant NFPA 1010 standard. However, the NTSB is concerned that volunteer fire departments in the state of Ohio are called on to respond to the same incidents as their professional counterparts, as seen in this accident, but that volunteers may have only a fraction of the training Ohio requires for professional firefighters: 36 hours instead of at least 160 hours. Further, the Ohio statute significantly limits initial training for volunteers and has resulted in a prohibition on training in hazardous environments. While the statute instructs local authorities to provide additional training, it establishes no clear requirements or guidance on what additional training is appropriate. The EPFD personnel who responded to the derailment and fire had varying training levels related to hazardous materials that ranged from no training at all to technician-level training, but the NTSB has not found evidence that their roles in the initial emergency response were tailored to their individual training levels. The NTSB concludes that the state of Ohio's statutory requirements for volunteer firefighter training were insufficient to support a safe emergency response to the East Palestine derailment led by a volunteer fire department. Therefore, the NTSB recommends that the state of Ohio amend its firefighter training statute and revise its volunteer firefighter certification standards to meet the NFPA 1010 standard for professional firefighters.

The National Volunteer Fire Council (NVFC) represents the interests of the volunteer fire, EMS, and rescue services. The International Association of Fire Chiefs (IAFC) represents the interests of emergency responders with a focus on leaders. The International Association of Fire Fighters (IAFF) is a labor union representing firefighters, emergency medical workers, and rescue workers in the United States and Canada.<sup>126</sup> These organizations provide resources, programs, education, and advocacy for emergency responders and are positioned to encourage adoption of standards to protect their members' safety, including identifying trainings and sources of funding. Thus, the NTSB recommends that the NVFC, IAFC, and IAFF advise their members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs. The NTSB also recommends that the NVFC identify barriers to adequate fire and emergency response training for volunteer firefighters, particularly for situations where hazardous materials are present, and publish actions states, municipalities, and the private sector can take to provide the flexibility necessary for volunteer firefighters to obtain training.

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| 07/26/24 | Addressee | Official Correspondence | 73542 |
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# Recommendation Report

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-From Edward A. Kelly, General President: On behalf of the nearly 350,000 professional fire fighters and emergency medical personnel of the International Association of Fire Fighters (IAFF), thank you for your work to investigate the tragic and catastrophic train derailment in East Palestine, Ohio last year. While future rail emergencies are inevitable, our work is critical to ensuring America's first responders can perform their jobs as safely and efficiently as possible. The IAFF looks forward to continuing to educate fire fighters on how they can most effectively protect their communities from similar incidents.

The IAFF is the largest representative of professional fire fighters in the United States. Since 1996, we have been proud to partner with the Department of Transportation in providing training to fire fighters and other first responders on how they can effectively and safely respond to a variety of hazardous materials incidents, including those occurring on trains. We currently offer our members a catalog of training opportunities that are ProBoard accredited and delivered by experienced and skilled trainers. Our classes are delivered virtually and in person at fire departments nationwide. In 2023, the IAFF is proud to have delivered nearly 300 hazardous materials classes to more than 6,000 fire fighters. Additionally, our members and instructors are proud to present at internationally attended IAFF conferences, such as the IAFF Redmond Health and Safety Symposium and IAFF Affiliate Leader Training Summit, and at partner conferences like the Fire Department Instructors Conference and the IAFC Hazmat Response Teams Conference.

The IAFF appreciates recommendation R-24-23 from your investigation, and we plan to continue our work to inform the fire service of the need to be trained on hazardous materials incidents and to build and maintain their technical proficiencies. We have already shared information with our members on the tragic derailment in East Palestine<sup>1</sup> and plan to conduct additional outreach, with a focus on the vent and burn process that occurred in East Palestine. This will ensure fire fighters recognize this practice and can adequately prepare themselves and their communities. We are also pleased to support the Department of Transportation's latest rulemaking, which requires train operators to provide real-time information to fire fighters and other first responders. Our union was actively involved in the development of this rule by providing our first-hand perspectives on what fire fighters need to stay safe on the job. We are actively working with DOT to further educate the fire service on this new rule and the events that necessitated its adoption.

Our union also appreciates your recommendation R-24-24 on the need to educate fire fighters and emergency response personnel on the circumstances surrounding the vent and burn at East Palestine and the importance of obtaining shipper information when considering vent and burn operations. We hope the new rule from DOT will assist fire fighters in obtaining this information and informing the response protocols utilized. The IAFF commits to actively reviewing and assessing the NTSB's report and incorporating your recommendations on vent and burn, and other response tactics and considerations, when developing the curriculum and content of our training courses. The IAFF is in the process of developing a safety bulletin for the fire service, as well as a potential safety stand down to further educate all of our fire fighters whose primary response areas include active rail lines.

I would also be remiss if I did not mention our active support for the Occupational Safety and Health Administration's (OSHA) recently proposed Emergency Response Standard (ERS). As you may know, a key component of the ERS includes requiring jurisdictions to conduct hazard assessments of their communities and pre-plan for major emergency responses. The IAFF is deeply concerned about the number of jurisdictions with active rail lines that have not yet planned for a major derailment or other train emergency. As you have noted in multiple places throughout your report, such as in Section 1.9.4, fire fighter training is paramount when ensuring fire fighters' ability to mitigate emergencies safely and effectively. Statutes that permit limited training opportunities for fire fighters (professional or volunteer) only compound this danger. The IAFF is proud to support OSHA's ERS and urges all fire departments to ensure their members are sufficiently trained to respond to any hazardous materials incident or rail emergency. Fire fighters' training and ability to respond to these emergencies directly impacts their safety and that of the public. As you note throughout your investigations into the events in East Palestine, we cannot continue to allow untrained and unprepared fire fighters to pay the price for municipal leaders' complacent attitudes.

Thank you again for your critical work investigating the derailment in East Palestine. Your report is crucial to ensuring the safety of fire fighters and the communities we serve. The IAFF values our partnership with the NTSB and looks forward to continuing to work with you to ensure safe and effective transportation systems nationwide.

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| <b>Addressee:</b> | National Volunteer Fire Council | Open - Await Response | <b>Date Closed:</b> | N/A |
| <b>07/12/24</b>   | NTSB                            | Transmittal Letter    | 73264               |     |

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The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-022, R-24-023, and R-24-024). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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# Recommendation Report

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## 2.3.1 Initial Deployment of Firefighters

The EPFD responded to 911 calls and reached the accident scene within 10 minutes of the derailment. During this stage of the emergency response, EPFD firefighters did not have access to the consist of train 32N but had observed tank cars among the derailed and burning equipment. The applicable guidance from the 2020 ERG was the "Mixed Load / Unidentified Cargo" entry for a fire involving tank cars, which advised a half-mile (or 2,640-foot) preliminary isolation and evacuation of the scene, noted the need for self-contained breathing apparatuses, and cautioned that materials may react violently with extinguishing agents, including water (PHMSA 2020). The entry recommended the use of water to cool containers but cautions against allowing water to enter those containers.

The EPFD deputy fire chief set up a command post at a business about 400 feet from the burning train, more than 2,000 feet inside the ERG-recommended isolation and evacuation zone. Without referencing the 2020 ERG, volunteer firefighters approached the pileup and began applying water to contain the fire, which grew rapidly. Firefighters were equipped with self-contained breathing apparatuses, but without more information about the train's consist, the incident commander had no way of determining whether this personal protective equipment was adequate for operations within the half-mile isolation zone. The NTSB concludes that, while the EPFD deputy fire chief and other volunteer firefighters acted in good faith to protect their community, the initial emergency response did not conform to ERG guidance for fires involving tank cars and unknown materials; both the proximity of the first command post to the fire and the use of manned hoses near a fire involving unknown materials placed these firefighters at unnecessary risk.

Pre-certification volunteer firefighter training in Ohio is limited by statute under State of Ohio Revised Code Section 4765.55. A training course for a Volunteer Firefighter certificate may not exceed 36 hours. According to guidance distributed by Ohio EMS, the foundational volunteer firefighter course does not permit participation in training involving hazardous environments because of this



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time constraint (Ohio EMS 2023). The basic 36-hour training course does not meet the NFPA 1010 standard for professional firefighters (or the NFPA 1001 standard in place at the time of the derailment), which requires a minimum of 160 hours of training and includes job performance requirements not addressed in the volunteer course. Fire chiefs or authorities having jurisdiction are responsible for providing additional training for volunteer firefighters expected to operate in hazardous environments. However, the statute does not specify minimum standards, specific courses, or demonstration of skills or knowledge to ensure that additional training adequately prepares firefighters for hazardous environments. The EPFD deputy fire chief had completed two additional courses in hazardous materials awareness and operations in 2022, but the response in East Palestine still deviated from recommended practices by placing firefighters near burning tank cars and establishing a command post a few hundred feet from a fire involving unknown hazardous materials.

Statutory requirements and training courses for professional firefighters in Ohio meet the relevant NFPA 1010 standard. However, the NTSB is concerned that volunteer fire departments in the state of Ohio are called on to respond to the same incidents as their professional counterparts, as seen in this accident, but that volunteers may have only a fraction of the training Ohio requires for professional firefighters: 36 hours instead of at least 160 hours. Further, the Ohio statute significantly limits initial training for volunteers and has resulted in a prohibition on training in hazardous environments. While the statute instructs local authorities to provide additional training, it establishes no clear requirements or guidance on what additional training is appropriate. The EPFD personnel who responded to the derailment and fire had varying training levels related to hazardous materials that ranged from no training at all to technician-level training, but the NTSB has not found evidence that their roles in the initial emergency response were tailored to their individual training levels. The NTSB concludes that the state of Ohio's statutory requirements for volunteer firefighter training were insufficient to support a safe emergency response to the East Palestine derailment led by a volunteer fire department. Therefore, the NTSB recommends that the state of Ohio amend its firefighter training statute and revise its volunteer firefighter certification standards to meet the NFPA 1010 standard for professional firefighters.

The National Volunteer Fire Council (NVFC) represents the interests of the volunteer fire, EMS, and rescue services. The International Association of Fire Chiefs (IAFC) represents the interests of emergency responders with a focus on leaders. The International Association of Fire Fighters (IAFF) is a labor union representing firefighters, emergency medical workers, and rescue workers in the United States and Canada.<sup>126</sup> These organizations provide resources, programs, education, and advocacy for emergency responders and are positioned to encourage adoption of standards to protect their members' safety, including identifying trainings and sources of funding. Thus, the NTSB recommends that the NVFC, IAFC, and IAFF advise their members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs. The NTSB also recommends that the NVFC identify barriers to adequate fire and emergency response training for volunteer firefighters, particularly for situations where hazardous materials are present, and publish actions states, municipalities, and the private sector can take to provide the flexibility necessary for volunteer firefighters to obtain training.



# Recommendation Report

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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

**Recommendation # :** R-24-024 **Overall Status:** Open - Initial Response Received CLASS II

TO THE INTERNATIONAL ASSOCIATION OF FIRE CHIEFS, THE INTERNATIONAL ASSOCIATION OF FIRE FIGHTERS, AND THE NATIONAL VOLUNTEER FIRE COUNCIL: Advise your members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate.

**# of Addressees:** 3 **Overall Date Closed:** N/A

**Addressee:** International Association of Fire Chiefs **Open - Initial Response Received** **Date Closed:** N/A

**07/12/24** NTSB Transmittal Letter 73264

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 cause 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 any accident or event investigated by the agency. 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 attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-023 and R-24-024). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.



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We are providing the following information to urge the International Association of Fire Chiefs to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision;
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the International Association of Fire Chiefs. Additional information regarding these recommendations can be found in the noted sections of the report.

- Advise your members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs. (R-24-23) (See section 2.3.1.)
- Advise your members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate. (R-24-24) (See section 2.5.4.)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-23



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and -24). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.4 Vent and Burn Criteria

The FRA recognizes the vent and burn method as a valid but high-risk last-resort procedure for unloading tank cars transporting at least certain compressed liquified flammable gases, as shown by its 1994 and 2007 guidance on the method. The second 2007 report (Phase II of the associated study) includes guidance on when a vent and burn should be considered, what commodities are candidates for the procedure, and how an incident command should approach the decision (FRA 2007a). At least one individual involved in the East Palestine emergency response had knowledge of the 2007 study and Phase II report; the NS regional hazardous materials manager, then employed by the AAR, was one of the contributing authors. However, there is no evidence that the specific guidance in the Phase II report was used during the vent and burn decision, and the incident commander was not aware of the report's existence. Even if he had known about the report, he would not have had ready access to it because of the report's status as Sensitive Security Information. While it is unclear whether access to the Phase II report would have led the incident commander to a different decision, the report would have provided him with additional information and the tools needed to ask further questions of NS and its contractors. The Phase II report's guidance, cautions, and checklists would have provided the incident commander with additional knowledge and resources when deciding whether to approve the vent and burn. The presence of public, well-known criteria for when to attempt vent and burn procedures would also have provided a baseline for conversations among NS, its contractors, and the rest of the incident command.

On May 6, 2007, the FRA released publicly available versions of the Phase I and Phase II reports on its website, but web publication may not be sufficient to distribute this guidance. The 1994 handbook was available on the FRA's website at the time of the East Palestine derailment but was not consulted during the lead-up to the vent and burn. The NTSB is concerned that the FRA's most recent and complete guidance about when to attempt the vent and burn method has not been widely disseminated to emergency responders. A vent and burn procedure was not necessary in East Palestine to prevent a BLEVE, but what was true in East Palestine may not hold in other circumstances or for other products. The NTSB concludes that the significant local and environmental impacts of a vent and burn decision demonstrate the need for federal guidance about what products and circumstances are candidates for the vent and burn method. The NTSB recommends that the FRA distribute the public versions of its 2007 vent and burn reports to emergency responder associations, including the IAFC, IAFF, and NVFC. To increase awareness of federal guidance, the NTSB recommends that the IAFC, IAFF, and NVFC advise their members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate.

While the 2007 reports contain useful guidance, they were developed before the East Palestine vent and burn and therefore do not incorporate lessons learned from that accident. The Phase II report does not advise an incident command to contact the shipper when considering a vent and burn, for example, instead directing the incident commander to a database that has not been widely distributed. The checklist provided in the Phase II report does not always clearly indicate how the answers to its questions should shape a vent and burn decision. For example, it includes a row for product viscosity (high, medium, or low) but does not clearly explain how an incident command can determine viscosities or how different viscosities will affect a vent and burn (FRA 2007a). The NTSB recommends that the FRA update and re-publish its 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re-published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. The NTSB also recommends that the FRA make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency



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responder associations, including the IAFC, IAFF, and NVFC. The NTSB also recommends that PHMSA distribute the FRA's most current guidance on the vent and burn method to emergency response agencies by referencing it in the next edition of the ERG.

| 10/09/24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Addressee | Official Correspondence | 73829 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|-------|
| <p>-From Fire Chief Josh Waldo, CFO, EFO, IAFC President and Board Chair 2024-2025: On behalf of the nearly 11,000 members of the International Association of Fire Chiefs (IAFC), I write this letter in response to the National Transportation Safety Board's (NTSB) safety recommendations R-24-23 and R-24-24. The IAFC is a 501(c)(3) organization that represents the leadership of America's fire and emergency service. For over 150 years, the IAFC has been at the forefront of advocating for increased safety on all modes of transportation. Working with our subject matter experts, we have developed the following plan on how best to respond to these safety recommendations. The IAFC believes that these actions will lead to increased safety for future railroad incidents.</p> |           |                         |       |

Below are the specific recommendations from the NTSB to the IAFC:

- Advise your members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs. (R-24-23)
- Advise your members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate. (R-24-24)

To best implement the safety recommendations, the IAFC formed a working group comprised of members of the IAFC Hazardous Materials (Hazmat) Committee. The IAFC Hazmat Committee is a collection of industry experts, who convene to review best practices for responses to hazardous materials incidents. The working group will develop the training materials requested by the NTSB and develop a survey of the IAFC membership -- as requested by the NTSB -- to determine how many firefighters are trained to the NFPA 1010, Standard on Professional Qualifications for Firefighters.

Article re: Vent and Burn Best Practices: The IAFC Hazmat Committee's working group will draft an article that includes information regarding the decision to Vent and Burn the rail tanker cars at the East Palestine derailment. The article also will include Vent and Burn best practices (including current federal guidance), and the need for Vent and Burn operations in the future. The article will emphasize the need for unified command during Vent and Burn operations.

The IAFC staff will update the IAFC Hazmat Fusion Center website (Hazmat Fusion Center ([iafc.org](http://iafc.org))) to include best practices and resources for responding to Vent and Burn incidents.

The IAFC thanks the NTSB for its focus on preparing local fire and EMS departments for incidents involving the transportation of hazardous materials by rail. The IAFC plans on satisfying NTSB safety recommendations R-24-23 and R-24-24 by the end of 2024. It is our hope that fulfilling these safety recommendations, increased safety on America's railways will be the result.

| Addressee: | International Association of Fire Fighters | Open - Initial Response Received | Date Closed: | N/A |
|------------|--------------------------------------------|----------------------------------|--------------|-----|
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| 07/12/24 | NTSB | Transmittal Letter | 73264 |
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- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision;
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to the International Association of Fire Fighters. Additional information regarding these recommendations can be found in the noted sections of the report.

- Advise your members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs. (R-24-23) (See section 2.3.1.)



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- Advise your members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate. (R-24-24) (See section 2.5.4.)

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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.4 Vent and Burn Criteria

The FRA recognizes the vent and burn method as a valid but high-risk last-resort procedure for unloading tank cars transporting at least certain compressed liquified flammable gases, as shown by its 1994 and 2007 guidance on the method. The second 2007 report (Phase II of the associated study) includes guidance on when a vent and burn should be considered, what commodities are candidates for the procedure, and how an incident command should approach the decision (FRA 2007a). At least one individual involved in the East Palestine emergency response had knowledge of the 2007 study and Phase II report; the NS regional hazardous materials manager, then employed by the AAR, was one of the contributing authors. However, there is no evidence that the specific guidance in the Phase II report was used during the vent and burn decision, and the incident commander was not aware of the report's existence. Even if he had known about the report, he would not have had ready access to it because of the report's status as Sensitive Security Information. While it is unclear whether access to the Phase II report would have led the incident commander to a different decision, the report would have provided him with additional information and the tools needed to ask further questions of NS and its contractors. The Phase II report's guidance, cautions, and checklists would have provided the incident commander with additional knowledge and resources when deciding whether to approve the vent and burn. The presence of public, well-known criteria for when to attempt vent and burn procedures would also have provided a baseline for conversations among NS, its contractors, and the rest of the incident command.

On May 6, 2007, the FRA released publicly available versions of the Phase I and Phase II reports on its website, but web publication may not be sufficient to distribute this guidance. The 1994 handbook was available on the FRA's website at the time of the East Palestine derailment but was not consulted during the lead-up to the vent and burn. The NTSB is concerned that the FRA's most recent and complete guidance about when to attempt the vent and burn method has not been widely disseminated to emergency responders. A vent and burn procedure was not necessary in East Palestine to prevent a BLEVE, but what was true in East Palestine may not hold in other circumstances or for other products. The NTSB concludes that the significant local and environmental impacts of a vent and burn decision demonstrate the need for federal guidance about what products and circumstances are candidates for the vent and burn method. The NTSB recommends that the FRA distribute the public versions of its 2007 vent and burn reports to emergency responder associations, including the IAFC, IAFF, and NVFC. To increase awareness of federal guidance, the NTSB recommends that the IAFC, IAFF, and NVFC advise their members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate.

While the 2007 reports contain useful guidance, they were developed before the East Palestine vent and burn and therefore do not incorporate lessons learned from that accident. The Phase II report does not advise an incident command to contact the shipper when considering a vent and burn, for example, instead directing the incident commander to a database that has not been widely distributed. The checklist provided in the Phase II report does not always clearly indicate how the answers to its questions should



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shape a vent and burn decision. For example, it includes a row for product viscosity (high, medium, or low) but does not clearly explain how an incident command can determine viscosities or how different viscosities will affect a vent and burn (FRA 2007a). The NTSB recommends that the FRA update and re-publish its 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re-published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. The NTSB also recommends that the FRA make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the IAFC, IAFF, and NVFC. The NTSB also recommends that PHMSA distribute the FRA's most current guidance on the vent and burn method to emergency response agencies by referencing it in the next edition of the ERG.

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| 07/26/24 | Addressee | Official Correspondence | 73542 |
|----------|-----------|-------------------------|-------|



# Recommendation Report

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-From Edward A. Kelly, General President: On behalf of the nearly 350,000 professional fire fighters and emergency medical personnel of the International Association of Fire Fighters (IAFF), thank you for your work to investigate the tragic and catastrophic train derailment in East Palestine, Ohio last year. While future rail emergencies are inevitable, our work is critical to ensuring America's first responders can perform their jobs as safely and efficiently as possible. The IAFF looks forward to continuing to educate fire fighters on how they can most effectively protect their communities from similar incidents.

The IAFF is the largest representative of professional fire fighters in the United States. Since 1996, we have been proud to partner with the Department of Transportation in providing training to fire fighters and other first responders on how they can effectively and safely respond to a variety of hazardous materials incidents, including those occurring on trains. We currently offer our members a catalog of training opportunities that are ProBoard accredited and delivered by experienced and skilled trainers. Our classes are delivered virtually and in person at fire departments nationwide. In 2023, the IAFF is proud to have delivered nearly 300 hazardous materials classes to more than 6,000 fire fighters. Additionally, our members and instructors are proud to present at internationally attended IAFF conferences, such as the IAFF Redmond Health and Safety Symposium and IAFF Affiliate Leader Training Summit, and at partner conferences like the Fire Department Instructors Conference and the IAFC Hazmat Response Teams Conference.

The IAFF appreciates recommendation R-24-23 from your investigation, and we plan to continue our work to inform the fire service of the need to be trained on hazardous materials incidents and to build and maintain their technical proficiencies. We have already shared information with our members on the tragic derailment in East Palestine<sup>1</sup> and plan to conduct additional outreach, with a focus on the vent and burn process that occurred in East Palestine. This will ensure fire fighters recognize this practice and can adequately prepare themselves and their communities. We are also pleased to support the Department of Transportation's latest rulemaking, which requires train operators to provide real-time information to fire fighters and other first responders. Our union was actively involved in the development of this rule by providing our first-hand perspectives on what fire fighters need to stay safe on the job. We are actively working with DOT to further educate the fire service on this new rule and the events that necessitated its adoption.

Our union also appreciates your recommendation R-24-24 on the need to educate fire fighters and emergency response personnel on the circumstances surrounding the vent and burn at East Palestine and the importance of obtaining shipper information when considering vent and burn operations. We hope the new rule from DOT will assist fire fighters in obtaining this information and informing the response protocols utilized. The IAFF commits to actively reviewing and assessing the NTSB's report and incorporating your recommendations on vent and burn, and other response tactics and considerations, when developing the curriculum and content of our training courses. The IAFF is in the process of developing a safety bulletin for the fire service, as well as a potential safety stand down to further educate all of our fire fighters whose primary response areas include active rail lines.

I would also be remiss if I did not mention our active support for the Occupational Safety and Health Administration's (OSHA) recently proposed Emergency Response Standard (ERS). As you may know, a key component of the ERS includes requiring jurisdictions to conduct hazard assessments of their communities and pre-plan for major emergency responses. The IAFF is deeply concerned about the number of jurisdictions with active rail lines that have not yet planned for a major derailment or other train emergency. As you have noted in multiple places throughout your report, such as in Section 1.9.4, fire fighter training is paramount when ensuring fire fighters' ability to mitigate emergencies safely and effectively. Statutes that permit limited training opportunities for fire fighters (professional or volunteer) only compound this danger. The IAFF is proud to support OSHA's ERS and urges all fire departments to ensure their members are sufficiently trained to respond to any hazardous materials incident or rail emergency. Fire fighters' training and ability to respond to these emergencies directly impacts their safety and that of the public. As you note throughout your investigations into the events in East Palestine, we cannot continue to allow untrained and unprepared fire fighters to pay the price for municipal leaders' complacent attitudes.

Thank you again for your critical work investigating the derailment in East Palestine. Your report is crucial to ensuring the safety of fire fighters and the communities we serve. The IAFF values our partnership with the NTSB and looks forward to continuing to work with you to ensure safe and effective transportation systems nationwide.

|                   |                                 |                       |                     |     |
|-------------------|---------------------------------|-----------------------|---------------------|-----|
| <b>Addressee:</b> | National Volunteer Fire Council | Open - Await Response | <b>Date Closed:</b> | N/A |
| <b>07/12/24</b>   | NTSB                            | Transmittal Letter    | 73264               |     |

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 cause 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



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members and survivors for any accident or event investigated by the agency. 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 attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-022, R-24-023, and R-24-024). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

All communications regarding safety recommendations will be stored by the NTSB and viewable by the public. Please do not send privileged or confidential communications in response to this recommendation. Responses marked as confidential or privileged (or similar designations) will be considered nonresponsive. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov).

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We are providing the following information to urge the National Volunteer Fire Council to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.nts.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.



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Accordingly, the NTSB makes the following safety recommendations to the National Volunteer Fire Council. Additional information regarding these recommendations can be found in the noted sections of the report.

- Identify barriers to adequate fire and emergency response training for volunteer firefighters, particularly for situations where hazardous materials are present, and publish actions states, municipalities, and the private sector can take to provide the flexibility necessary for volunteer firefighters to obtain training. (R-24-22) (See section 2.3.1.)
- Advise your members of the circumstances of the East Palestine derailment and fire, identify fire departments whose personnel are not trained to the NFPA 1010 standard for professional firefighters, recommend that these departments adopt training that meets this standard, and inform them of funded training opportunities available through private, state, and federal programs. (R-24-23) (See section 2.3.1.)
- Advise your members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate. (R-24-24) (See section 2.5.4.)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-22 through -24). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.4 Vent and Burn Criteria

The FRA recognizes the vent and burn method as a valid but high-risk last-resort procedure for unloading tank cars transporting at least certain compressed liquified flammable gases, as shown by its 1994 and 2007 guidance on the method. The second 2007 report (Phase II of the associated study) includes guidance on when a vent and burn should be considered, what commodities are candidates for the procedure, and how an incident command should approach the decision (FRA 2007a). At least one individual involved in the East Palestine emergency response had knowledge of the 2007 study and Phase II report; the NS regional hazardous materials manager, then employed by the AAR, was one of the contributing authors. However, there is no evidence that the specific guidance in the Phase II report was used during the vent and burn decision, and the incident commander was not aware of the report's existence. Even if he had known about the report, he would not have had ready access to it because of the report's status as Sensitive Security Information. While it is unclear whether access to the Phase II report would have led the incident commander to a different decision, the report would have provided him with additional information and the tools needed to ask further questions of NS and its contractors. The Phase II report's guidance, cautions, and checklists would have provided the incident commander with additional knowledge and resources when deciding whether to approve the vent and burn. The presence of public, well-known criteria for when to attempt vent and burn procedures would also have provided a baseline for conversations among NS, its contractors, and the rest of the incident command.

On May 6, 2007, the FRA released publicly available versions of the Phase I and Phase II reports on its website, but web publication may not be sufficient to distribute this guidance. The 1994 handbook was available on the FRA's website at the time of the East Palestine derailment but was not consulted during the lead-up to the vent and burn. The NTSB is concerned that the FRA's most recent and complete guidance about when to attempt the vent and burn method has not been widely disseminated to emergency responders. A vent and burn procedure was not necessary in East Palestine to prevent a BLEVE, but what was true in East Palestine



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may not hold in other circumstances or for other products. The NTSB concludes that the significant local and environmental impacts of a vent and burn decision demonstrate the need for federal guidance about what products and circumstances are candidates for the vent and burn method. The NTSB recommends that the FRA distribute the public versions of its 2007 vent and burn reports to emergency responder associations, including the IAFC, IAFF, and NVFC. To increase awareness of federal guidance, the NTSB recommends that the IAFC, IAFF, and NVFC advise their members of the circumstances surrounding the vent and burn at East Palestine, the importance of obtaining information from the shipper when considering a vent and burn, and the availability of federal guidance on when the vent and burn method may be appropriate.

While the 2007 reports contain useful guidance, they were developed before the East Palestine vent and burn and therefore do not incorporate lessons learned from that accident. The Phase II report does not advise an incident command to contact the shipper when considering a vent and burn, for example, instead directing the incident commander to a database that has not been widely distributed. The checklist provided in the Phase II report does not always clearly indicate how the answers to its questions should shape a vent and burn decision. For example, it includes a row for product viscosity (high, medium, or low) but does not clearly explain how an incident command can determine viscosities or how different viscosities will affect a vent and burn (FRA 2007a). The NTSB recommends that the FRA update and re-publish its 2007 vent and burn reports to include clear instructions to consult the shipper when considering a vent and burn, more comprehensive guidance on what products are candidates for a vent and burn along with what chemical and other hazards may result, and an updated process flow chart incorporating lessons from the East Palestine vent and burn; the re-published reports should identify the questions an incident commander should ask when considering a vent and burn, distinguish the meaning of the answers, and identify the resources necessary to make an informed decision. The NTSB also recommends that the FRA make the updated versions of the 2007 vent and burn reports described in R-24-8 available to emergency responder associations, including the IAFC, IAFF, and NVFC. The NTSB also recommends that PHMSA distribute the FRA's most current guidance on the vent and burn method to emergency response agencies by referencing it in the next edition of the ERG.



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                               |                    |                            |                             |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------|-----------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                     | R-24-025           | <b>Overall Status:</b>     | Open - Acceptable Response  | CLASS II |
| TO THE CHLORINE INSTITUTE: Review and revise Pamphlet 171 to ensure that its safety messages about vinyl chloride monomer polymerization in tank cars are accurate and adequately support determining whether a rail accident poses a risk of polymerization. |                    |                            |                             |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                       | 1                  |                            | <b>Overall Date Closed:</b> | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                             | Chlorine Institute | Open - Acceptable Response | <b>Date Closed:</b>         | N/A      |

**07/12/24** NTSB Transmittal Letter 73264

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 cause 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 any accident or event investigated by the agency. 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 attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-025, R-24-026, and R-24-027). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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similar designations) will be considered nonresponsive. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov).

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We are providing the following information to urge The Chlorine Institute to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to The Chlorine Institute. Additional information regarding these recommendations can be found in the noted sections of the report.

- Review and revise Pamphlet 171 to ensure that its safety messages about vinyl chloride monomer polymerization in tank cars are accurate and adequately support determining whether a rail accident poses a risk of polymerization. (R-24-25) (See section 2.5.2.)
- Review and revise your Chlorine Emergency Plan training and verification programs to ensure that Level 3 contractors possess or can obtain enough technical knowledge of vinyl chloride monomer (VCM) to accurately assess and respond to chemical hazards like polymerization during a VCM incident. (R-24-26) (See section 2.5.2.)
- Advise your members of the circumstances of the East Palestine derailment and fire and the need for shippers to ensure their expertise is communicated to and shared with the full incident command. (R 24 27) (See section 2.5.3.)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-25 through -27). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments,



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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.2 Quality of VCM Hazard Information

Sources of VCM hazard information referenced by NS and its contractors before the vent and burn included the 2020 ERG, Oxy Vinyls' SDS, and The Chlorine Institute's Pamphlet 171. The 2020 ERG and Oxy Vinyls' SDS both list polymerization as a hazard associated with VCM. However, the 2020 ERG and SDS guidance are both intended to address circumstances other than when the VCM is within the interior of a mechanically intact tank car. The SDS guidance is intended to address potential hazards to include industrial settings and other environments distinct from conditions incident to transportation. Given that the SDS is required by regulation to address a wide range of hazards and the 2020 ERG is intended as a quick-reference guide for initial responses to a variety of transportation-related incidents, it is reasonable to expect that both will include guidance that addresses a wide range of applications and requires further context and expertise to use effectively.

Pamphlet 171 includes guidance specifically for emergency response involving intact VCM tank cars. This guidance states that a pressure above 68 psig or a tank surface temperature reading "above ambient temperature" may be indicative of polymerization. While these statements are true—exothermic polymerization produces increases in temperature and pressure—they do not take into consideration other explanations of elevated temperatures and pressures and can lead the reader to incorrectly conclude polymerization is occurring. Further, Pamphlet 171 may bias the reader against more probable explanations by stating that increased temperature and pressure together mean that polymerization is "most likely occurring in the tank car." This statement is not true for an intact tank car that has been exposed to a fire or was otherwise externally heated. Further, temperature and pressure are correlated and therefore should not be treated as two separate signs of polymerization.

As discussed in section 2.5.1, expert opinion and historical evidence both indicate that dangerous polymerization of VCM is unlikely within an intact tank car. Pamphlet 171's claim that increases in temperature and pressure indicate that polymerization is "most likely" occurring in intact VCM tank cars is overstated and therefore misleading. NS and its contractors referred to Pamphlet 171 in addition to the Oxy Vinyls SDS and 2020 ERG while forming their initial judgments that polymerization was occurring within the derailed VCM tank cars. The NTSB concludes that language in The Chlorine Institute's Pamphlet 171 overstates the probability of VCM polymerization in scenarios where tank cars remain intact, likely leading those using the pamphlet during an emergency response effort to overestimate the likelihood of polymerization. Therefore, the NTSB recommends that The Chlorine Institute review and revise Pamphlet 171 to ensure that its safety messages about VCM polymerization in tank cars are accurate and adequately support determining whether a rail accident poses a risk of polymerization. The NTSB also recommends that Oxy Vinyls update the SDS for VCM to accurately reflect the potential risks of VCM and the hazards that increase such risks.

SPSI and SRS were Level 3 CHLOREP contractors vetted by The Chlorine Institute to provide expertise and a capable emergency response to chlorine incidents. CHLOREP is intended to provide emergency responders—including incident commands—with accurate information and chlorine industry expertise. The capabilities The Chlorine Institute requires for Level 3 contractors do not specifically include vent and burn decision-making, focusing instead on safe field transfer (transloading) of chlorine products from damaged packaging. The Chlorine Institute verifies these capabilities every 3 years.

As the president of SPSI told the NTSB in an interview, one of the reasons SPSI and SRS did not attempt transloading of VCM was concern that the product had already polymerized, making it unsafe to move regardless of the condition of the VCM tank cars' fittings. However, available evidence did not indicate polymerization, and polymerization had not occurred. SRS and SPSI did not correctly interpret evidence relevant to polymerization, recognize the limitations or inaccuracies of the available written guidance about VCM hazards, or make use of Oxy Vinyls' expert opinion that available evidence did not point to polymerization. The events at East Palestine show that knowledge of VCM chemistry sufficient to determine whether polymerization has occurred is relevant to the



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intended role of Level 3 CHLOREP contractors, which should be capable of transloading VCM whenever it is safe to do so and of providing accurate hazard information to the full incident command. The NTSB concludes that because Level 3 CHLOREP contractors are expected to provide advanced emergency response capabilities, including communicating expertise to other on-scene personnel and the transloading of VCM, these contractors should possess or know how to obtain enough technical knowledge to accurately assess how chemical hazards, such as polymerization, affect a safe response to a VCM incident. The NTSB recommends that The Chlorine Institute review and revise its CHLOREP training and verification programs to ensure that Level 3 contractors possess or can obtain enough technical knowledge of VCM to accurately assess and respond to chemical hazards like polymerization during a VCM incident.

Information recorded on the scene by emergency response contractors, notably the temperatures of the tank cars and the timing of PRD actuation, was relevant to determining whether written guidance was accurate and effective in supporting the emergency response. Fire-exposed VCM tank cars did exhibit elevated temperatures and pressures—which Pamphlet 171 states are indicators of likely polymerization—but later examinations found no evidence that polymerization had occurred. The NTSB concludes that information collected during real-world accidents is a vital resource in ensuring that hazardous materials guidance is suitable for supporting responses to transportation emergencies. The NTSB recommends that NS adopt policies to ensure that its emergency response contractors keep detailed records of information used to make decisions involving hazardous materials, and share this information with shippers, relevant chemical associations, and other entities that provide hazardous materials guidance.

10/10/24

Addressee

Official Correspondence

73821

-From Frank Reiner, President: The Chlorine Institute (CI or the Institute) is a 190-member, not-for-profit trade association of chlor-alkali producers worldwide, as well as packagers, distributors, users, and suppliers. CI exists to support the chlor-alkali industry in advancing safe, secure, environmentally compatible, and sustainable production, distribution and use of its mission chemicals.<sup>1</sup> The Institute's North American Producer members account for a majority of chlorine production capacity in the U.S., Canada, and Mexico, along with the majority of caustic soda and caustic potash production, hydrochloric acid production and one hundred percent of chlorine re-packagers. The Institute's mission chemicals are used throughout the North American economy and are key to the protection of public health and the production of a wide range of everyday goods.

CI shares the National Transportation Safety Board's (NTSB's) goal of implementing improved transportation best practices and making additional safety information and guidance available for continued safe transportation of hazardous materials and effective emergency response actions. CI's Transportation Issue Team focuses on maintaining the ability to transport chlorine and other mission chemicals in a safe and secure manner, as well as aiming for zero transportation releases and accidents of CI mission chemicals. This issue team meets regularly to analyze bulk transportation incident data (made available through the Pipeline and Hazardous Materials Safety Administration's public Hazmat Incident Report Search Tool), discuss regulatory activity and current issues impacting hazardous materials transportation, and make focused efforts to improve bulk mission chemical transportation. CI's Emergency Preparedness Issue Team focuses on minimizing the impact of a chlorine release by enabling the first responders to react in an effective manner and ensure that CI's Chlorine Emergency Plan (CHLOREP)<sup>2</sup> remains an effective emergency response tool. This issue team also meets regularly to discuss the CHLOREP mutual aid response network and CI's outreach to and training for the first responder community.

The Institute is very interested in NTSB investigations that are relevant to our mission, and any recommendations CI receives that result from an investigation are taken very seriously.

Background: CI appreciates the NTSB's use of CI's safety guidance as a resource during its investigation of the East Palestine, OH derailment. Vinyl chloride monomer (VCM) was added as a CI mission chemical in 2015, so it is the newest mission chemical for us. The scope of VCM as a CI mission chemical is strictly focused on distribution, including emergency response. The Chlorine Institute and the Vinyl Institute have an agreement to work together on VCM transportation-related matters. CI's first initiative related to VCM was a workshop held in 2016, with participants representing producers, shippers, railroads, and emergency response contractors to exchange knowledge of VCM bulk transportation and emergency response.

Following that workshop, CI, working with members, workshop participants, and other industry experts, developed Edition 1 of Pamphlet 171, Vinyl Chloride Monomer (VCM) Tank Car & Cargo Tank Handling Manual. Consistent with CI's other transportation safety pamphlets, a large portion of Pamphlet 171 focuses on transportation handling, including key regulations, loading and unloading considerations (including various inspection steps), security measures during transit, and general emergency response considerations. One section was developed to cover VCM product specific transportation considerations, including pressure, temperature, handling and storage, flammability, toxicology, acute exposure effects, and personal protective equipment. The



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Pamphlet also included certain emergency response considerations, such as initial actions at an emergency scene, potential leak sources and mitigation techniques, and emergency field transfers. In addition, the Pamphlet included a model product safety data sheet, which was based on VCM shippers' Safety Data Sheets. Edition 1 was approved by CI's Transportation Issue Team and Emergency Preparedness Issue Team in July 2018.

**Proposed Action:** In response to R 24-25, CI has retained Bill Carroll, PhD (an expert who participated in the NTSB's June 2023 East Palestine investigative hearing) to review Pamphlet 171 and the NTSB's recommendation, and suggest appropriate revisions to that pamphlet. Based on Dr. Carroll's input and advice, CI plans to draft proposed revisions to the pamphlet to address NTSB Recommendation R- 24-25. We expect the proposed updates will primarily focus on describing and differentiating between different types of physical and chemical reactions that potentially could occur in connection with the transportation of VCM, including polymerization, thermal decomposition, peroxidation, stabilization, and vinyl chloride vapors. We anticipate that these proposed updates will provide readers with additional information regarding factors relevant to the potential for VCM polymerization in a rail accident involving cars carrying stabilized VCM, including conditions necessary for polymerization to occur.

The draft proposed revision to Pamphlet 171 will be presented to CI members for their consideration and input and go through CI's standard member review and approval process. It will then be reviewed by and considered for approval by CI's Transportation Issue Team and Emergency Preparedness Issue Team. Since Pamphlet 171 is co-labeled with The Vinyl Institute, we will also share a final draft for its approval. Once a final version is approved, the revised Pamphlet 171 will be published on CI's website and available to all CI members.

**Proposed Timeline:** Working on an expedited basis, CI will aim to publish the revision to Pamphlet 171 described above in Q1 2025.

## Conclusion

Our thoughts are with all affected by the East Palestine derailment. CI appreciates the NTSB's recommendations and the opportunity to work with the Board to improve hazardous materials transportation and emergency response. We hope the NTSB will find our proposed actions to be reasonable and appropriate responses to the Report's recommendations to CI. As mentioned above, we will aim to finalize responsive actions by Q1 2025, and issue new information to members in the months there after.

CI looks forward to the NTSB's response to our proposed plan.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |                         |       |
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| <b>01/14/25</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | NTSB | Official Correspondence | 73821 |
| We issued this recommendation because first responders in East Palestine referred to Pamphlet 171 for guidance on how to deal with VCM, but our investigation found that language in Pamphlet 171 overstates the probability of VCM polymerization in scenarios where tank cars remain intact, likely leading those using the pamphlet during an emergency response effort to overestimate the likelihood of polymerization.                                                                                                                      |      |                         |       |
| We note that the CI has obtained an expert to review and revise Pamphlet 171, and you believe the updates will provide more thorough information about how to determine polymerization risk. The CI will publish the revised pamphlet once it is completed and approved by CI members and its Transportation Issue and Emergency Preparedness Issue Teams, as well as relevant reviewers at The Vinyl Institute (co-publishers of the pamphlet). We understand that you intend this updated version to be completed in the first quarter of 2025. |      |                         |       |
| We look forward to reviewing the updated pamphlet. Pending your publication and our review of the revised Pamphlet 171, Safety Recommendation R-24-25 is classified OPEN-- ACCEPTABLE RESPONSE.                                                                                                                                                                                                                                                                                                                                                   |      |                         |       |



# Recommendation Report

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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

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| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                        | R-24-026           | <b>Overall Status:</b>                | Open Acceptable<br>Alternate Response | CLASS II |
| TO THE CHORLINE INSTITUTE: Review and revise your Chlorine Emergency Plan training and verification programs to ensure that Level 3 contractors possess or can obtain enough technical knowledge of vinyl chloride monomer (VCM) to accurately assess and respond to chemical hazards like polymerization during a VCM incident. |                    |                                       |                                       |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                          | 1                  |                                       | <b>Overall Date Closed:</b>           | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                                                                                | Chlorine Institute | Open Acceptable<br>Alternate Response | <b>Date Closed:</b>                   | N/A      |

**07/12/24** NTSB Transmittal Letter 73264

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 cause 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 any accident or event investigated by the agency. 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 attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-025, R-24-026, and R-24-027). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

All communications regarding safety recommendations will be stored by the NTSB and viewable by the public. Please do not send privileged or confidential communications in response to this recommendation. Responses marked as confidential or privileged (or



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similar designations) will be considered nonresponsive. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov).

The National Transportation Safety Board (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.

We are providing the following information to urge The Chlorine Institute to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to The Chlorine Institute. Additional information regarding these recommendations can be found in the noted sections of the report.

- Review and revise Pamphlet 171 to ensure that its safety messages about vinyl chloride monomer polymerization in tank cars are accurate and adequately support determining whether a rail accident poses a risk of polymerization. (R-24-25) (See section 2.5.2.)
- Review and revise your Chlorine Emergency Plan training and verification programs to ensure that Level 3 contractors possess or can obtain enough technical knowledge of vinyl chloride monomer (VCM) to accurately assess and respond to chemical hazards like polymerization during a VCM incident. (R-24-26) (See section 2.5.2.)
- Advise your members of the circumstances of the East Palestine derailment and fire and the need for shippers to ensure their expertise is communicated to and shared with the full incident command. (R 24 27) (See section 2.5.3.)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-25 through -27). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments,



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exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

All communications regarding safety recommendations are stored by the NTSB and viewable by the public. Please do not send privileged or confidential communications in response to these recommendations. Responses marked as confidential or privileged (or similar designations) will be considered nonresponsive. In the likely event that your company uses auto generated and/or preformatted confidentiality statements on letterhead or outgoing e-mails, please include a statement in your letter indicating that the information can be publicly released. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov).

From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.2 Quality of VCM Hazard Information

Sources of VCM hazard information referenced by NS and its contractors before the vent and burn included the 2020 ERG, Oxy Vinyls' SDS, and The Chlorine Institute's Pamphlet 171. The 2020 ERG and Oxy Vinyls' SDS both list polymerization as a hazard associated with VCM. However, the 2020 ERG and SDS guidance are both intended to address circumstances other than when the VCM is within the interior of a mechanically intact tank car. The SDS guidance is intended to address potential hazards to include industrial settings and other environments distinct from conditions incident to transportation. Given that the SDS is required by regulation to address a wide range of hazards and the 2020 ERG is intended as a quick-reference guide for initial responses to a variety of transportation-related incidents, it is reasonable to expect that both will include guidance that addresses a wide range of applications and requires further context and expertise to use effectively.

Pamphlet 171 includes guidance specifically for emergency response involving intact VCM tank cars. This guidance states that a pressure above 68 psig or a tank surface temperature reading "above ambient temperature" may be indicative of polymerization. While these statements are true—exothermic polymerization produces increases in temperature and pressure—they do not take into consideration other explanations of elevated temperatures and pressures and can lead the reader to incorrectly conclude polymerization is occurring. Further, Pamphlet 171 may bias the reader against more probable explanations by stating that increased temperature and pressure together mean that polymerization is "most likely occurring in the tank car." This statement is not true for an intact tank car that has been exposed to a fire or was otherwise externally heated. Further, temperature and pressure are correlated and therefore should not be treated as two separate signs of polymerization.

As discussed in section 2.5.1, expert opinion and historical evidence both indicate that dangerous polymerization of VCM is unlikely within an intact tank car. Pamphlet 171's claim that increases in temperature and pressure indicate that polymerization is "most likely" occurring in intact VCM tank cars is overstated and therefore misleading. NS and its contractors referred to Pamphlet 171 in addition to the Oxy Vinyls SDS and 2020 ERG while forming their initial judgments that polymerization was occurring within the derailed VCM tank cars. The NTSB concludes that language in The Chlorine Institute's Pamphlet 171 overstates the probability of VCM polymerization in scenarios where tank cars remain intact, likely leading those using the pamphlet during an emergency response effort to overestimate the likelihood of polymerization. Therefore, the NTSB recommends that The Chlorine Institute review and revise Pamphlet 171 to ensure that its safety messages about VCM polymerization in tank cars are accurate and adequately support determining whether a rail accident poses a risk of polymerization. The NTSB also recommends that Oxy Vinyls update the SDS for VCM to accurately reflect the potential risks of VCM and the hazards that increase such risks.

SPSI and SRS were Level 3 CHLOREP contractors vetted by The Chlorine Institute to provide expertise and a capable emergency response to chlorine incidents. CHLOREP is intended to provide emergency responders—including incident commands—with accurate information and chlorine industry expertise. The capabilities The Chlorine Institute requires for Level 3 contractors do not specifically include vent and burn decision-making, focusing instead on safe field transfer (transloading) of chlorine products from damaged packaging. The Chlorine Institute verifies these capabilities every 3 years.

As the president of SPSI told the NTSB in an interview, one of the reasons SPSI and SRS did not attempt transloading of VCM was concern that the product had already polymerized, making it unsafe to move regardless of the condition of the VCM tank cars' fittings. However, available evidence did not indicate polymerization, and polymerization had not occurred. SRS and SPSI did not correctly interpret evidence relevant to polymerization, recognize the limitations or inaccuracies of the available written guidance about VCM hazards, or make use of Oxy Vinyls' expert opinion that available evidence did not point to polymerization. The events at East Palestine show that knowledge of VCM chemistry sufficient to determine whether polymerization has occurred is relevant to the



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intended role of Level 3 CHLOREP contractors, which should be capable of transloading VCM whenever it is safe to do so and of providing accurate hazard information to the full incident command. The NTSB concludes that because Level 3 CHLOREP contractors are expected to provide advanced emergency response capabilities, including communicating expertise to other on-scene personnel and the transloading of VCM, these contractors should possess or know how to obtain enough technical knowledge to accurately assess how chemical hazards, such as polymerization, affect a safe response to a VCM incident. The NTSB recommends that The Chlorine Institute review and revise its CHLOREP training and verification programs to ensure that Level 3 contractors possess or can obtain enough technical knowledge of VCM to accurately assess and respond to chemical hazards like polymerization during a VCM incident.

Information recorded on the scene by emergency response contractors, notably the temperatures of the tank cars and the timing of PRD actuation, was relevant to determining whether written guidance was accurate and effective in supporting the emergency response. Fire-exposed VCM tank cars did exhibit elevated temperatures and pressures—which Pamphlet 171 states are indicators of likely polymerization—but later examinations found no evidence that polymerization had occurred. The NTSB concludes that information collected during real-world accidents is a vital resource in ensuring that hazardous materials guidance is suitable for supporting responses to transportation emergencies. The NTSB recommends that NS adopt policies to ensure that its emergency response contractors keep detailed records of information used to make decisions involving hazardous materials, and share this information with shippers, relevant chemical associations, and other entities that provide hazardous materials guidance.

10/10/24

Addressee

Official Correspondence

73821

-From Frank Reiner, President: The Chlorine Institute (CI or the Institute) is a 190-member, not-for-profit trade association of chlor-alkali producers worldwide, as well as packagers, distributors, users, and suppliers. CI exists to support the chlor-alkali industry in advancing safe, secure, environmentally compatible, and sustainable production, distribution and use of its mission chemicals.<sup>1</sup> The Institute's North American Producer members account for a majority of chlorine production capacity in the U.S., Canada, and Mexico, along with the majority of caustic soda and caustic potash production, hydrochloric acid production and one hundred percent of chlorine re-packagers. The Institute's mission chemicals are used throughout the North American economy and are key to the protection of public health and the production of a wide range of everyday goods.

CI shares the National Transportation Safety Board's (NTSB's) goal of implementing improved transportation best practices and making additional safety information and guidance available for continued safe transportation of hazardous materials and effective emergency response actions. CI's Transportation Issue Team focuses on maintaining the ability to transport chlorine and other mission chemicals in a safe and secure manner, as well as aiming for zero transportation releases and accidents of CI mission chemicals. This issue team meets regularly to analyze bulk transportation incident data (made available through the Pipeline and Hazardous Materials Safety Administration's public Hazmat Incident Report Search Tool), discuss regulatory activity and current issues impacting hazardous materials transportation, and make focused efforts to improve bulk mission chemical transportation. CI's Emergency Preparedness Issue Team focuses on minimizing the impact of a chlorine release by enabling the first responders to react in an effective manner and ensure that CI's Chlorine Emergency Plan (CHLOREP)<sup>2</sup> remains an effective emergency response tool. This issue team also meets regularly to discuss the CHLOREP mutual aid response network and CI's outreach to and training for the first responder community.

The Institute is very interested in NTSB investigations that are relevant to our mission, and any recommendations CI receives that result from an investigation are taken very seriously.

## Background:

Following the 2016 VCM workshop, CI coordinated the development of emergency response training by the experts from producers, shippers, and emergency response contractors. This training presentation includes a high-level overview of VCM and its transportation, covering the following:

- Basics on product identification at the facility and in transportation
- VCM physical and chemical properties, including reactivity and flammability hazards
- Typical bulk transportation modes and packages
- General emergency response considerations, highlighting that VCM emergency response can be very technical and high risk and recommending the use of CI-verified CHLOREP Level 3 Contractors
- Appropriate personal protective equipment
- Acute health effects and exposure treatment



- Incident case studies

This presentation, which CI calls “VCM 101,” was introduced into CI’s annual CHLOREP Team Training schedule in 2016. The CHLOREP mutual aid network is primarily aimed at ensuring timely and effective response to chlorine emergencies in transportation and at smaller end-user facilities. For this reason, CI’s annual CHLOREP Team Training is largely focused on chlorine emergency response considerations through classroom lectures, practice with chlorine emergency kit application, and several scenario-based field exercises. Understanding that CHLOREP industry response teams and contractors also handle other CI mission chemicals, the annual CHLOREP Training also provides a basic overview of all CI’s other mission chemicals similar to that described above for VCM. These CI mission chemical “101” presentations are intended to only provide a high-level awareness of the chemicals.

What CI refers to as “CHLOREP Contractors” were introduced as part of the CHLOREP program to ensure the availability of additional chlorine emergency response resources, beyond the traditional CHLOREP mutual aid network (i.e., industry CHLOREP Teams). Because CHLOREP is primarily focused on chlorine emergency response, CI’s CHLOREP Contractor program is largely aimed at verifying that certain hazmat emergency response contractors have completed training on chlorine emergency considerations, have compatible and well-maintained chlorine response equipment in place, and have procedures for responding to chlorine emergencies. At the request of CI members, the contractor program also verifies that those contractors have similar training, equipment, and procedures for responding to other mission chemical emergencies.

CI’s CHLOREP Contractor Program has two levels that may be achieved, whose basic requirements include:

## Level 2

Provide evidence of experience, training, equipment, and procedures for the following response methods to CI mission chemicals (excluding anhydrous hydrogen chloride (AHCl) and vinyl chloride monomer (VCM)):

- Apply CI Emergency A-Kit (for leaking chlorine cylinders), B-Kit (for leaking chlorine ton containers and C-Kits (for chlorine tank car leaks from valves or pressure relief device)
- Use of chlorine cylinder recovery vessel (a.k.a. salvage cylinder)
- Field transfer of sodium hydroxide (NaOH), potassium hydroxide (KOH), sodium hypochlorite (bleach), and hydrochloric acid (HCl)
- Patching and plugging for CI mission chemicals,
- Contain mission chemical spills on soil and in water
- Environmentally responsible cleanup of mission chemicals
- Mitigate releases from cargo tanks transporting for mission chemicals

## Level 3

Provide evidence of experience, training, equipment, and procedures for the following response methods to all CI mission chemicals:

- All Level 2 requirements
- Field transfer of chlorine from all containers
- Change valves on chlorine cylinders, ton containers, and properly prepared chlorine residue tank cars and cargo tanks at any location
- Field transfer of AHCl and VCM

It is important to highlight that CI’s program “verifies” contractor capabilities. Through the verification process, CI simply confirms that the contractors have trained personnel, compatible and well-maintained emergency response equipment, and mission chemical emergency response procedures according to the program requirements. CI also reviews contractors’ field experience with responding to CI mission chemical incidents. CI does not evaluate or certify the content and quality of contractors’ training programs and response procedures, and we do not have the resources and expertise necessary to do so. CHLOREP Contractors are responsible for identifying opportunities for the required training and developing effective emergency response procedures themselves. CI does not determine which contractor to use when one is required for a CI mission chemical emergency. Depending on the circumstances, the choice of contractor is up to the railroad or shipper to decide (during rail emergencies it is typically the railroad that hires the contractor). CI members may review verification information for any of the CI-verified CHLOREP Contractors as part of their own process of vetting their preferred response contractors.



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To obtain Level 2 training and to gain a basic understanding of the other CI mission chemicals, contractors may send candidates to CI-hosted annual CHLOREP Team Training, whose classroom and field exercises focus primarily on chlorine emergency response. Contractors seeking Level 3 verification status must show they have completed appropriate training on performing chlorine field transfers and chlorine valve change-outs, as well as AHCI and VCM field transfers. Contractors report all relevant training on verification forms.

Periodically, CI facilitates an additional opportunity for chlorine producers/shippers, CHLOREP Contractors (mainly Level 3), and railroad hazmat personnel to come together and train on chlorine tank car field transfers and use of CI's liquid chlorine transfer pump (CI refers to this training as Advanced CHLOREP Training). 4 Advanced CHLOREP Training does not cover VCM field transfers, because CI does not have the expertise to conduct such a training opportunity as we are able to do for chlorine. Level 3 contractors must obtain that required training from other sources.

## Proposed Action:

CI's Emergency Preparedness Issue Team will review the CHLOREP Contractor Verification Program to identify potential revisions to the Level 3 contractor requirements to address the NTSB recommendation that those contractors are required to have technical knowledge necessary to accurately assess potential hazards of VCM, like polymerization, during an incident involving VCM. To address the training portion of the NTSB recommendation, CI believes we cannot significantly change our CHLOREP Training programs because those programs must remain focused on chlorine emergency response. However, we intend to discuss with our members who are VCM producers/shippers, and Level 3 contractors, CI facilitation of a meeting to discuss potential hazards of an incident involving VCM, and available incident mitigation methods, as well as the development of VCM-related training and education to enhance the capabilities of Level 3 contractors to assess and respond to chemical hazards during an incident involving VCM.

## Proposed Timeline:

CI will aim to develop appropriate revisions to CI's CHLOREP Contractor Verification Program for review and approval by the Emergency Preparedness Team by Q1, 2025. We also intend, by the end of Q1 2025, to develop a proposal for CI to facilitate a meeting with member VCM producers, shippers, and Level 3 contractors to address Recommendation 24-26.

## Conclusion

Our thoughts are with all affected by the East Palestine derailment. CI appreciates the NTSB's recommendations and the opportunity to work with the Board to improve hazardous materials transportation and emergency response. We hope the NTSB will find our proposed actions to be reasonable and appropriate responses to the Report's recommendations to CI. As mentioned above, we will aim to finalize responsive actions by Q1 2025, and issue new information to members in the months there after.

CI looks forward to the NTSB's response to our proposed plan.

|          |      |                         |       |
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| 01/14/25 | NTSB | Official Correspondence | 73821 |
|----------|------|-------------------------|-------|



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As we pointed out in our East Palestine report, we believe Level 3 CHLOREP contractors, who are expected to provide advanced emergency response capabilities (including communicating their expertise to other on-scene personnel), should possess, or know how to obtain, enough technical knowledge to accurately assess how chemical hazards, such as polymerization, may influence a VCM incident response.

We note that you will review and potentially revise the CI's Level 3 CHLOREP contractor verification program, but that the CI does not evaluate or certify the content and quality of contractors' training programs and response procedures (nor does it have the resources to do so). You also point out that the CI does not decide which contractor responds to an incident or what certification level a responding contractor has attained; that decision is usually made by the railroad in rail incidents.

Additionally, you assert that the CI cannot make significant changes to its CHLOREP training because the training needs to remain focused on chlorine emergency response; however, you will facilitate a meeting with member VCM producers, shippers, and Level 3 contractors to discuss the following:

- potential hazards of a VCM incident,
- available incident mitigation methods, and
- developing VCM-related training and education to enhance the capabilities of Level 3 contractors to assess and respond to chemical hazards during an incident involving VCM.

We believe these actions may represent an acceptable alternate way of implementing this recommendation. However, to meet the intent of the recommendation, we expect the enhanced VCM-related training to be incorporated into Level 3 contractor certification and recertification. Pending our review of any changes the CI makes to its contractor verification program, and an update on the outcome of its planned meeting with VCM producers, shippers, and Level 3 contractors, Safety Recommendation R-24-26 is classified OPEN-- ACCEPTABLE ALTERNATE RESPONSE.



# Recommendation Report

2/3/2025 10:29:33 AM

**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------|-----------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                          | R-24-027                   | <b>Overall Status:</b>     | Open - Acceptable Response  | CLASS II |
| TO THE AMERICAN CHEMISTRY COUNCIL AND THE CHLORINE INSTITUTE: Advise your members of the circumstances of the East Palestine derailment and fire and the need for shippers to ensure their expertise is communicated to and shared with the full incident command. |                            |                            |                             |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                            | 2                          |                            | <b>Overall Date Closed:</b> | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                  | American Chemistry Council | Open - Acceptable Response | <b>Date Closed:</b>         | N/A      |

**07/12/24** NTSB Transmittal Letter 73264

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 cause 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 any accident or event investigated by the agency. 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 attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-027). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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The National Transportation Safety Board (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.

We are providing the following information to urge the American Chemistry Council to act on the safety recommendation in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendation to the American Chemistry Council. Additional information regarding this recommendation can be found in the noted section of the report.

- Advise your members of the circumstances of the East Palestine derailment and fire and the need for shippers to ensure their expertise is communicated to and shared with the full incident command. (R 24 27) (See section 2.5.3.)

The NTSB is vitally interested in this recommendation because it is designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement this recommendation. When replying, please refer to the safety recommendation by number (Safety Recommendation R-24-27). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.3 Vent and Burn Communication and Justification

The vent and burn decision began with NS and its contractors interpreting an energetic PRD actuation on the afternoon of February 4, 2023, followed by cessation of PRD activity as a sign that VCM had polymerized and obstructed a PRD, causing a build up of pressure and then preventing the PRD from actuating again. According to the NTSB's interview with the SPSI president, on February 4, SPSI and NS were already "at a vent and burn" decision because of the unusual PRD activity and the polymerization hazard information in the 2020 ERG, Pamphlet 171, and SDS.

Starting on the morning of February 4, NS and its contractors had access to VCM expertise from Oxy Vinyls. Oxy Vinyls called into question the likelihood of polymerization. In a conference call with SPSI and NS on the afternoon of February 4, Oxy Vinyls personnel in Dallas, Texas, assessed a low probability of polymerization and recommended monitoring the tank cars' temperatures. Runaway exothermic polymerization would produce a rapid, sustained increase in temperature. This rapid, sustained increase in temperature was not occurring, as discussed in section 2.5.1.

On February 5, 2023, representatives from Oxy Vinyls arrived on the scene and met with SPSI and SRS personnel. During this meeting, the Oxy Vinyls logistics process supervisor explained the VCM stabilization process and that a lading temperature above 185°F could actuate a PRD but not introduce oxygen into the tank and destabilize the VCM. The Oxy Vinyl representatives indicated that they had never had a VCM incident lead to a BLEVE.

Despite this new information from Oxy Vinyls, NS and its contractors continued to respond to the situation as though the VCM was polymerizing. About 5:45 p.m. on February 5, 2023, after the meeting with Oxy Vinyls' on-scene representatives, SPSI and SRS contacted the incident commander and said that circumstances might require a vent and burn. This action demonstrated a focus on polymerization to the exclusion of alternatives even after Oxy Vinyls employees' initial judgment that polymerization was unlikely, and it ignored contradictory evidence: between 5:00 p.m. and 6:00 p.m., the measured temperature of the suspect tank car had fallen 2°F. The temperature continued to trend downward over the next day, as shown in figure 32. NS and its contractors continued to assert the necessity of a vent and burn when Oxy Vinyls' expert opinions and on-scene evidence should have led them to question their original focus on polymerization.

While NS and its contractors continued to advocate for a vent and burn, the on-scene Oxy Vinyls representatives conducted another conference call with the Oxy Vinyls team in Dallas. They reached a consensus that the available evidence did not indicate polymerization. By the time Oxy Vinyls met with SPSI at 7:00 p.m. on February 5, NS had begun preparations for the vent and burn. Oxy Vinyls shared its conclusions with SPSI, but SPSI did not reconsider its course of action, and neither SPSI nor NS shared Oxy Vinyls' conclusions with the rest of the incident command. The NTSB concludes that NS and its contractors continued to assert the necessity of a vent and burn after expert opinion and available evidence should have led them to re-evaluate their initial conclusions regarding polymerization.

Throughout these meetings and conversations, Oxy Vinyls had no contact with the incident commander or elements of the incident command other than through NS, SRS, and SPSI. Oxy Vinyls personnel expected NS and its contractors to relay information to the rest of the incident command. However, Oxy Vinyls' conclusions about the lack of polymerization were not relayed to the incident commander or other personnel in the incident command. There is no evidence that the incident command was aware that Oxy Vinyls was available as a source of expertise on VCM at any time up to the final vent and burn decision.

The incident commander, the EPFD fire chief, approved the vent and burn based on information from NS, SRS, and SPSI. The incident commander made his decision after two meetings on the afternoon of February 6, 2023. The first meeting involved the wider incident command and participation from entities not formally part of the incident command, such as the governors of Ohio and Pennsylvania. The second, smaller meeting involved only the incident commander, the Ohio Governor, and representatives from NS, SRS, and SPSI. Oxy Vinyls was not invited to or present at either meeting, and no attendees questioned the NS position that dangerous polymerization was occurring in the VCM tank cars.



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The NTSB is concerned by the absence of Oxy Vinyls' opinions and information from the decision-making process. At the NTSB's Investigative Hearing, the Oxy Vinyls technical manager testified that he was confident that Oxy Vinyls' opinions were being relayed to the full incident command, but NS and its contractors were not doing so. 156 During the second meeting on February 6, NS and its contractors told the incident commander that if the temperature in a tank car reached 153–158°F, the result would be an uncontrolled polymerization reaction. 157 This temperature range is not contained in the written guidance referenced during the emergency response and does not correspond to information that Oxy Vinyls shared with NS or its contractors. NS stated that if a tank car temperature reached 150°F, NS and its contractors would have to cease any efforts to prevent an explosion. NS also gave the incident commander a 13-minute time limit on his decision, claiming that the vent and burn needed to be conducted by 3:00 p.m. to finish in daylight and to avoid an atmospheric inversion that would hamper dispersion of the vapor cloud. The charges for the vent and burn were detonated at 4:37 p.m. following a series of delays, indicating that 3:00 p.m. was not a hard deadline for the procedure.

NS's communications with the incident commander produced a heightened sense of urgency around the vent and burn; the incident commander testified at the NTSB's Investigative Hearing that he had to make a decision quickly to avoid catastrophic failure of a tank car. 158 These communications included incomplete and inaccurate information that pushed the incident commander toward approving the vent and burn. The NTSB concludes that NS and its contractors compromised the integrity of the vent and burn decision by creating unwarranted urgency and not communicating expert opinions and information completely and accurately to the incident commander. Without Oxy Vinyls to share its determinations, the incident commander did not have a basis to effectively question the immediate necessity of the vent and burn. The NTSB concludes that the absence of Oxy Vinyls' expertise from the formal incident command denied the incident commander relevant information necessary to make a fully informed decision about the vent and burn. The NTSB recommends that Oxy Vinyls develop a policy to ensure that expertise on chemicals manufactured and offered for transportation by Oxy Vinyls is communicated to and shared with the full incident command during transportation accidents or incidents. The NTSB also recommends that the American Chemistry Council and The Chlorine Institute advise their members of the circumstances of the East Palestine derailment and fire and the need for shippers to ensure their expertise is communicated to and shared with the full incident command.

Oxy Vinyls developed conclusions about polymerizations and shared them with NS and its contractors in the expectation that its expertise would be passed onto decision-makers and taken into consideration. The NTSB is concerned by NS's decision not to relay Oxy Vinyls' conclusions that contradicted its early judgments about polymerization to the incident commander. NS was aware of expert opinions that contradicted its own and those of its contractors and, by not relaying the information, denied the rest of the incident command a chance to weigh the dissenting opinions before making a final decision.

Several explanations for NS's sustained preference for the vent and burn are consistent with available evidence, including confirmation bias and the perceived safety risks of alternative means of unloading the VCM. The explanations presented here are possibilities, but the evidence did not support a determination of which of these explanations, if any, was the main reason for the sustained preference for the vent and burn.

Confirmation bias is defined by the American Psychological Association as "the tendency to gather evidence that confirms preexisting expectations, typically by emphasizing or pursuing supporting evidence while dismissing or failing to seek contradictory evidence" (American Psychological Association 2018). NS and its contractors arrived at a belief in the need for a vent and burn as early as the afternoon of February 4, and the subsequent pattern of dismissing contradictory evidence while interpreting ambiguous evidence as support for the original belief is consistent with confirmation bias. Confirmation bias does not explain NS's inaccurate communications with the incident commander, but it does account for NS's failure to use Oxy Vinyls' expertise effectively or to revise its original position as more facts became available.

On February 5, 2023, NS told the NTSB that it had considered and rejected alternative means of unloading the VCM tank cars: transloading, hot tapping, and flaring. Several tank cars had damaged fittings, such as melted aluminum components, that could have made transloading or flaring the VCM unsafe or impossible. Hot tapping would have required personnel to puncture the tank cars and work near damaged equipment during the unloading process, exposing personnel to risk. Of the alternatives considered on the scene, NS described the vent and burn as presenting the least safety risk to railroad personnel, which was one reason NS provided for preferring the vent and burn and using the procedure on all five VCM tank cars instead of only the tank car with an elevated temperature (OCPX80370).

However, NS overlooked an alternative option: allowing the tank cars to finish cooling, then taking additional time to complete an assessment of each tank car's condition. When interviewed by the NTSB, the incident commander said he had been informed that the



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positions of the tank cars meant that venting and burning one would pose a risk to the others, and that venting and burning all five simultaneously was appropriate as a safety precaution. But a sixth tank car, a derailed DOT-105 tank car carrying isobutylene, a flammable gas in the same hazard class and division as VCM, was located closer than the four cooler VCM tank cars to tank car OCPX80370. The isobutylene tank car was therefore also closer to the vent and burn procedure performed on OCPX80370. The isobutylene tank car was not vented and burned, and it was successfully moved on February 7 and transloaded on February 23 following a damage assessment, which suggests that the nearby vent and burn did not render it unsafe to handle or unload. By performing a vent and burn of all five VCM tank cars on February 6, NS denied itself the option of assessing the structural condition and fittings of the VCM tank cars with the same thoroughness it applied to the isobutylene tank car.

The NTSB concludes that, no explanation or argument for NS and its contractors' continued advocacy for the vent and burn procedure justifies failing to communicate relevant expertise and dissenting opinions to the incident commander. The NTSB recommends that NS develop a policy to ensure that the expertise of manufacturers and shippers of hazardous materials involved in transportation accidents or incidents is communicated to its on-scene representatives and contractors and shared with the full incident command.

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| <b>10/04/24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Addressee | Official Correspondence | 73797 |
| <p>-From Jeffrey Sloan, Senior Director of Regulatory and Scientific Affairs: The American Chemistry Council (ACC) is pleased to respond to the National Transportation Safety Board's (NTSB) recommendation R-24-27 related to the February 3, 2023, derailment in East Palestine, OH. This letter outlines ACC's planned actions to address this recommendation.</p> <p>ACC and its members are committed to the safe transportation of hazardous materials throughout the supply chain. As part of Responsible Care®, the chemical industry's world-class environmental, health, safety and security performance initiative, our members continue to invest in training and technology, including railcars and other containers used to transport our products. We welcome the opportunity to work the NTSB and other stakeholders to further advance transportation safety.</p> <p>The NTSB has asked ACC to advise our members about the events at East Palestine and to emphasize the importance of shippers communicating their expertise to the full incident command.</p> <p>In response, ACC will provide the attached communication to the leadership and Responsible Care® contacts of each ACC member company. The communication provides a factual summary of the East Palestine incident from the NTSB's Final Report and emphasizes that all ACC members should be prepared to provide the railroad and incident command with timely and accurate information, as appropriate. It also reminds members that CHEMTREC®, an emergency response information provider that is part of ACC, can facilitate communication between emergency responders and a rail shipper to allow all relevant chemical information to be utilized in critical decisions following a derailment.</p> <p>ACC looks forward to your evaluation of this response and confirmation that it satisfactorily addresses the intent of the recommendation. If you have any questions, please contact me.</p> |           |                         |       |

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| <b>01/14/25</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | NTSB | Official Correspondence | 73821 |
| <p>Our East Palestine investigation found that the incident commander was not given all relevant expert information when considering approving a vent and burn operation and, therefore, could not make a fully informed decision. We note that you plan to communicate with the leadership of your member companies regarding the circumstances of the East Palestine derailment and fire and the need for shippers to ensure their expertise is communicated to and shared with the full incident command, as recommended. We appreciate you sending us a copy of the draft communication.</p> <p>We believe this communication, once sent out, will satisfy the intent of this recommendation, and we would like to receive a copy once you have finalized and distributed it. Pending our receipt of that information, Safety Recommendation R-24-27 is classified OPEN--ACCEPTABLE RESPONSE.</p> <p>Please update us at ExecutiveSecretariat@ntsb.gov on your progress toward addressing this recommendation, and do not submit both an electronic and a hard copy of the same response.</p> |      |                         |       |

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| <b>Addressee:</b> | Chlorine Institute | Open - Acceptable Response | <b>Date Closed:</b> | N/A |
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| <b>07/12/24</b> | NTSB | Transmittal Letter | 73264 |
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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 cause 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 any accident or event investigated by the agency. 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 attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-025, R-24-026, and R-24-027). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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We are providing the following information to urge The Chlorine Institute to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.nts.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;



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- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to The Chlorine Institute. Additional information regarding these recommendations can be found in the noted sections of the report.

- Review and revise Pamphlet 171 to ensure that its safety messages about vinyl chloride monomer polymerization in tank cars are accurate and adequately support determining whether a rail accident poses a risk of polymerization. (R-24-25) (See section 2.5.2.)
- Review and revise your Chlorine Emergency Plan training and verification programs to ensure that Level 3 contractors possess or can obtain enough technical knowledge of vinyl chloride monomer (VCM) to accurately assess and respond to chemical hazards like polymerization during a VCM incident. (R-24-26) (See section 2.5.2.)
- Advise your members of the circumstances of the East Palestine derailment and fire and the need for shippers to ensure their expertise is communicated to and shared with the full incident command. (R 24 27) (See section 2.5.3.)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-25 through -27). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.3 Vent and Burn Communication and Justification

The vent and burn decision began with NS and its contractors interpreting an energetic PRD actuation on the afternoon of February 4, 2023, followed by cessation of PRD activity as a sign that VCM had polymerized and obstructed a PRD, causing a build up of pressure and then preventing the PRD from actuating again. According to the NTSB's interview with the SPSI president, on February 4, SPSI and NS were already "at a vent and burn" decision because of the unusual PRD activity and the polymerization hazard information in the 2020 ERG, Pamphlet 171, and SDS.

Starting on the morning of February 4, NS and its contractors had access to VCM expertise from Oxy Vinyls. Oxy Vinyls called into question the likelihood of polymerization. In a conference call with SPSI and NS on the afternoon of February 4, Oxy Vinyls personnel in Dallas, Texas, assessed a low probability of polymerization and recommended monitoring the tank cars' temperatures. Runaway exothermic polymerization would produce a rapid, sustained increase in temperature. This rapid, sustained increase in temperature was not occurring, as discussed in section 2.5.1.

On February 5, 2023, representatives from Oxy Vinyls arrived on the scene and met with SPSI and SRS personnel. During this meeting, the Oxy Vinyls logistics process supervisor explained the VCM stabilization process and that a lading temperature above 185°F could actuate a PRD but not introduce oxygen into the tank and destabilize the VCM. The Oxy Vinyl representatives indicated that they had never had a VCM incident lead to a BLEVE.

Despite this new information from Oxy Vinyls, NS and its contractors continued to respond to the situation as though the VCM was polymerizing. About 5:45 p.m. on February 5, 2023, after the meeting with Oxy Vinyls' on-scene representatives, SPSI and SRS



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contacted the incident commander and said that circumstances might require a vent and burn. This action demonstrated a focus on polymerization to the exclusion of alternatives even after Oxy Vinyls employees' initial judgment that polymerization was unlikely, and it ignored contradictory evidence: between 5:00 p.m. and 6:00 p.m., the measured temperature of the suspect tank car had fallen 2°F. The temperature continued to trend downward over the next day, as shown in figure 32. NS and its contractors continued to assert the necessity of a vent and burn when Oxy Vinyls' expert opinions and on-scene evidence should have led them to question their original focus on polymerization.

While NS and its contractors continued to advocate for a vent and burn, the on-scene Oxy Vinyls representatives conducted another conference call with the Oxy Vinyls team in Dallas. They reached a consensus that the available evidence did not indicate polymerization. By the time Oxy Vinyls met with SPSI at 7:00 p.m. on February 5, NS had begun preparations for the vent and burn. Oxy Vinyls shared its conclusions with SPSI, but SPSI did not reconsider its course of action, and neither SPSI nor NS shared Oxy Vinyls' conclusions with the rest of the incident command. The NTSB concludes that NS and its contractors continued to assert the necessity of a vent and burn after expert opinion and available evidence should have led them to re-evaluate their initial conclusions regarding polymerization.

Throughout these meetings and conversations, Oxy Vinyls had no contact with the incident commander or elements of the incident command other than through NS, SRS, and SPSI. Oxy Vinyls personnel expected NS and its contractors to relay information to the rest of the incident command. However, Oxy Vinyls' conclusions about the lack of polymerization were not relayed to the incident commander or other personnel in the incident command. There is no evidence that the incident command was aware that Oxy Vinyls was available as a source of expertise on VCM at any time up to the final vent and burn decision.

The incident commander, the EPFD fire chief, approved the vent and burn based on information from NS, SRS, and SPSI. The incident commander made his decision after two meetings on the afternoon of February 6, 2023. The first meeting involved the wider incident command and participation from entities not formally part of the incident command, such as the governors of Ohio and Pennsylvania. The second, smaller meeting involved only the incident commander, the Ohio Governor, and representatives from NS, SRS, and SPSI. Oxy Vinyls was not invited to or present at either meeting, and no attendees questioned the NS position that dangerous polymerization was occurring in the VCM tank cars.

The NTSB is concerned by the absence of Oxy Vinyls' opinions and information from the decision-making process. At the NTSB's Investigative Hearing, the Oxy Vinyls technical manager testified that he was confident that Oxy Vinyls' opinions were being relayed to the full incident command, but NS and its contractors were not doing so. 156 During the second meeting on February 6, NS and its contractors told the incident commander that if the temperature in a tank car reached 153–158°F, the result would be an uncontrolled polymerization reaction. 157 This temperature range is not contained in the written guidance referenced during the emergency response and does not correspond to information that Oxy Vinyls shared with NS or its contractors. NS stated that if a tank car temperature reached 150°F, NS and its contractors would have to cease any efforts to prevent an explosion. NS also gave the incident commander a 13-minute time limit on his decision, claiming that the vent and burn needed to be conducted by 3:00 p.m. to finish in daylight and to avoid an atmospheric inversion that would hamper dispersion of the vapor cloud. The charges for the vent and burn were detonated at 4:37 p.m. following a series of delays, indicating that 3:00 p.m. was not a hard deadline for the procedure.

NS's communications with the incident commander produced a heightened sense of urgency around the vent and burn; the incident commander testified at the NTSB's Investigative Hearing that he had to make a decision quickly to avoid catastrophic failure of a tank car. 158 These communications included incomplete and inaccurate information that pushed the incident commander toward approving the vent and burn. The NTSB concludes that NS and its contractors compromised the integrity of the vent and burn decision by creating unwarranted urgency and not communicating expert opinions and information completely and accurately to the incident commander. Without Oxy Vinyls to share its determinations, the incident commander did not have a basis to effectively question the immediate necessity of the vent and burn. The NTSB concludes that the absence of Oxy Vinyls' expertise from the formal incident command denied the incident commander relevant information necessary to make a fully informed decision about the vent and burn. The NTSB recommends that Oxy Vinyls develop a policy to ensure that expertise on chemicals manufactured and offered for transportation by Oxy Vinyls is communicated to and shared with the full incident command during transportation accidents or incidents. The NTSB also recommends that the American Chemistry Council and The Chlorine Institute advise their members of the circumstances of the East Palestine derailment and fire and the need for shippers to ensure their expertise is communicated to and shared with the full incident command.

Oxy Vinyls developed conclusions about polymerizations and shared them with NS and its contractors in the expectation that its expertise would be passed onto decision-makers and taken into consideration. The NTSB is concerned by NS's decision not to relay



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Oxy Vinyls' conclusions that contradicted its early judgements about polymerization to the incident commander. NS was aware of expert opinions that contradicted its own and those of its contractors and, by not relaying the information, denied the rest of the incident command a chance to weigh the dissenting opinions before making a final decision.

Several explanations for NS's sustained preference for the vent and burn are consistent with available evidence, including confirmation bias and the perceived safety risks of alternative means of unloading the VCM. The explanations presented here are possibilities, but the evidence did not support a determination of which of these explanations, if any, was the main reason for the sustained preference for the vent and burn.

Confirmation bias is defined by the American Psychological Association as "the tendency to gather evidence that confirms preexisting expectations, typically by emphasizing or pursuing supporting evidence while dismissing or failing to seek contradictory evidence" (American Psychological Association 2018). NS and its contractors arrived at a belief in the need for a vent and burn as early as the afternoon of February 4, and the subsequent pattern of dismissing contradictory evidence while interpreting ambiguous evidence as support for the original belief is consistent with confirmation bias. Confirmation bias does not explain NS's inaccurate communications with the incident commander, but it does account for NS's failure to use Oxy Vinyls' expertise effectively or to revise its original position as more facts became available.

On February 5, 2023, NS told the NTSB that it had considered and rejected alternative means of unloading the VCM tank cars: transloading, hot tapping, and flaring. Several tank cars had damaged fittings, such as melted aluminum components, that could have made transloading or flaring the VCM unsafe or impossible. Hot tapping would have required personnel to puncture the tank cars and work near damaged equipment during the unloading process, exposing personnel to risk. Of the alternatives considered on the scene, NS described the vent and burn as presenting the least safety risk to railroad personnel, which was one reason NS provided for preferring the vent and burn and using the procedure on all five VCM tank cars instead of only the tank car with an elevated temperature (OCPX80370).

However, NS overlooked an alternative option: allowing the tank cars to finish cooling, then taking additional time to complete an assessment of each tank car's condition. When interviewed by the NTSB, the incident commander said he had been informed that the positions of the tank cars meant that venting and burning one would pose a risk to the others, and that venting and burning all five simultaneously was appropriate as a safety precaution. But a sixth tank car, a derailed DOT-105 tank car carrying isobutylene, a flammable gas in the same hazard class and division as VCM, was located closer than the four cooler VCM tank cars to tank car OCPX80370. The isobutylene tank car was therefore also closer to the vent and burn procedure performed on OCPX80370. The isobutylene tank car was not vented and burned, and it was successfully moved on February 7 and transloaded on February 23 following a damage assessment, which suggests that the nearby vent and burn did not render it unsafe to handle or unload. By performing a vent and burn of all five VCM tank cars on February 6, NS denied itself the option of assessing the structural condition and fittings of the VCM tank cars with the same thoroughness it applied to the isobutylene tank car.

The NTSB concludes that, no explanation or argument for NS and its contractors' continued advocacy for the vent and burn procedure justifies failing to communicate relevant expertise and dissenting opinions to the incident commander. The NTSB recommends that NS develop a policy to ensure that the expertise of manufacturers and shippers of hazardous materials involved in transportation accidents or incidents is communicated to its on-scene representatives and contractors and shared with the full incident command.

| 10/10/24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Addressee | Official Correspondence | 73821 |
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| <p>-From Frank Reiner, President: The Chlorine Institute (CI or the Institute) is a 190-member, not-for-profit trade association of chlor-alkali producers worldwide, as well as packagers, distributors, users, and suppliers. CI exists to support the chlor-alkali industry in advancing safe, secure, environmentally compatible, and sustainable production, distribution and use of its mission chemicals.<sup>1</sup> The Institute's North American Producer members account for a majority of chlorine production capacity in the U.S., Canada, and Mexico, along with the majority of caustic soda and caustic potash production, hydrochloric acid production and one hundred percent of chlorine re-packagers. The Institute's mission chemicals are used throughout the North American economy and are key to the protection of public health and the production of a wide range of everyday goods.</p> <p>CI shares the National Transportation Safety Board's (NTSB's) goal of implementing improved transportation best practices and making additional safety information and guidance available for continued safe transportation of hazardous materials and effective emergency response actions. CI's Transportation Issue Team focuses on maintaining the ability to transport chlorine and other mission chemicals in a safe and secure manner, as well as aiming for zero transportation releases and accidents of CI mission</p> |           |                         |       |



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chemicals. This issue team meets regularly to analyze bulk transportation incident data (made available through the Pipeline and Hazardous Materials Safety Administration's public Hazmat Incident Report Search Tool), discuss regulatory activity and current issues impacting hazardous materials transportation, and make focused efforts to improve bulk mission chemical transportation. CI's Emergency Preparedness Issue Team focuses on minimizing the impact of a chlorine release by enabling the first responders to react in an effective manner and ensure that CI's Chlorine Emergency Plan (CHLOREP)<sup>2</sup> remains an effective emergency response tool. This issue team also meets regularly to discuss the CHLOREP mutual aid response network and CI's outreach to and training for the first responder community.

The Institute is very interested in NTSB investigations that are relevant to our mission, and any recommendations CI receives that result from an investigation are taken very seriously.

## Background:

CI has been regularly updating its members about the East Palestine derailment and surrounding circumstances, including the NTSB's investigation, and related activity, starting shortly after the derailment occurred in February 2023. This has been done in part through CI member meetings and in monthly updates to its members. It also included hosting the NTSB's lead investigator of the incident with respect to relevant issues, who presented an overview of the incident and the Board's hazmat transportation and emergency response-investigation findings and recommendations (during CI's Fall Meeting on September 18, 2024).

Shippers of hazardous materials are required to provide emergency contact information on the shipping papers per 49 CFR 172.604. That information also must be included in the shipper's Safety Data Sheet (SDS), which is provided with the shipping papers, per 29 CFR 1910.1200. Many chemical shippers are registered with CHEMTREC, a 24/7 hazmat emergency call center, which is available for emergency contact. CHEMTREC is a reliable resource for notifying shippers of an incident and for first responders to obtain technical information. Rail carriers also have regulatory requirements for notification of incidents and for communicating pertinent emergency information to first responders, emergency managers, and government officials.

Parties involved in a derailment share responsibility to communicate accurate information that is necessary to mitigate hazards and risks created by the incident. Regarding shippers endeavoring to communicate relevant product knowledge and information following a derailment to incident commanders, it can be difficult for a shipper to determine whether cars carrying their products have derailed or are otherwise at risk. It can also be difficult for them to get prompt access to the incident command. In derailments like that in East Palestine, an Incident Commander could be overwhelmed by communications from numerous shippers whose input may not be necessary, while they are simultaneously managing the immediate protection of the public and mitigation of the effects and risks of the incident. There are often multiple commodities from various shippers included in a train involved in a derailment. If all such shippers seek to communicate to the incident command, it may add unnecessary complexity and generate confusion and distraction. The full incident command and Incident Commander should have ready information and knowledge of commodities of concern and their shippers, and be receptive to communications from relevant shippers, and where appropriate, their input and participation in situation analysis, consideration of risks and mitigation options, and evaluation of potential response actions.

Response to derailments like East Palestine are guided by the National Incident Management System (NIMS), established by the Federal Emergency Management Agency (FEMA). NIMS materials include a section on Communications and Information Management. This section contains little discussion of the need to involve private entities and organizations in the incident management and response process. In the Conclusion section, FEMA notes that NIMS is a living document that is open to stakeholder feedback on best practices and lessons learned. In addition to the Report's recommendation regarding the importance of relevant shippers communicating the needed chemical response information, CI suggests the NTSB discuss with FEMA possible revisions to NIMS documents to highlight the importance and benefits of involving shippers in the incident command for hazardous materials incidents.

## Proposed Action:

CI plans to issue a memo to its members that addresses the following:

- Provide the NTSB staff presentation on East Palestine presentation from CI's 2024 Fall Meeting.
- Provide a link to the NTSB's full final investigation report, highlighting the recommendations to CI and other relevant recommendations.
- Recommend that shippers update their emergency response plans to include plans and procedures for communicating their



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expertise, when appropriate, to responsible parties including incident command during a derailment response.

- Encourage members that conduct outreach and train responders to highlight the benefits that a shipper's product expertise can bring when appropriately communicated with an incident command.

CI's Emergency Preparedness Issue Team will also look at its first responder training program to identify appropriate places to highlight the importance of recognizing and sharing a shippers' expertise where appropriate in a hazardous materials incident response.

## Proposed Timeline:

CI will aim to prepare communication for review and approval by the Emergency Preparedness Issue Team in Q1 2025, to be distributed to members in the following months.

## Conclusion

Our thoughts are with all affected by the East Palestine derailment. CI appreciates the NTSB's recommendations and the opportunity to work with the Board to improve hazardous materials transportation and emergency response. We hope the NTSB will find our proposed actions to be reasonable and appropriate responses to the Report's recommendations to CI. As mentioned above, we will aim to finalize responsive actions by Q1 2025, and issue new information to members in the months there after.

CI looks forward to the NTSB's response to our proposed plan.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |                         |       |
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| 01/14/25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | NTSB | Official Correspondence | 73821 |
| <p>Our East Palestine investigation found that the incident commander was not given all relevant expert information when considering approving a vent and burn operation and, therefore, could not make a fully informed decision. We note that you have been keeping your members informed of this accident and the investigation since it occurred, and you have taken and are planning several actions to address this recommendation. For example, you wrote that the CI hosted an NTSB presentation on the investigation at its fall meeting in September 2024. You will also issue a memo to members that includes a link to our report and recommends that shippers update their emergency response plans to include plans and procedures for communicating their expertise to incident command when appropriate. Your member memo will also encourage members that conduct outreach and training for responders to emphasize the benefits that a shipper's product expertise can bring when appropriately communicated with an incident command. We understand that the CI Emergency Preparedness Issue Team will also review its first responder training program to see where it can highlight the importance of recognizing and sharing a shipper's expertise during a hazardous materials incident response.</p> <p>We believe these actions, once complete, will satisfy the intent of this safety recommendation. Pending our review of the distributed memo and information about any relevant updates to your first responder training program, Safety Recommendation R-24-27 is classified OPEN-- ACCEPTABLE RESPONSE.</p> |      |                         |       |



# Recommendation Report

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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                               |          |                        |                                  |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                     | R-24-028 | <b>Overall Status:</b> | Open - Initial Response Received | CLASS II |
| TO NORFOLK SOUTHERN CORPORATION: Review and revise your procedures to immediately provide emergency responders with an accurate copy of the train consist upon becoming aware of an accident. |          |                        |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                       | 1        |                        | <b>Overall Date Closed:</b>      | N/A      |

|                   |                              |                                  |                     |     |
|-------------------|------------------------------|----------------------------------|---------------------|-----|
| <b>Addressee:</b> | Norfolk Southern Corporation | Open - Initial Response Received | <b>Date Closed:</b> | N/A |
|-------------------|------------------------------|----------------------------------|---------------------|-----|

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|-----------------|------|--------------------|-------|
| <b>07/12/24</b> | NTSB | Transmittal Letter | 73264 |
|-----------------|------|--------------------|-------|

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 cause 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 any accident or event investigated by the agency. 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 attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-028, R-24-029, R-24-030, and R-24-031). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

All communications regarding safety recommendations will be stored by the NTSB and viewable by the public. Please do not send privileged or confidential communications in response to this recommendation. Responses marked as confidential or privileged (or similar designations) will be considered nonresponsive. If you have concerns about this protocol, please contact us at



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ExecutiveSecretariat@ntsb.gov.

The National Transportation Safety Board (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.

We are providing the following information to urge Norfolk Southern Railway to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to Norfolk Southern Railway. Additional information regarding these recommendations can be found in the noted sections of the report.

- Review and revise your procedures to immediately provide emergency responders with an accurate copy of the train consist upon becoming aware of an accident. (R-24-28) (See section 2.3.2.)
- Update your submissions to the Pipeline and Hazardous Materials Safety Administration's Incident Database to accurately reflect the cause of package failures following the East Palestine derailment. (R-24-29) (See section 2.5.1.)
- Adopt policies to ensure that your emergency response contractors keep detailed records of information used to make decisions involving hazardous materials, and share this information with shippers, relevant chemical associations, and other entities that provide hazardous materials guidance. (R 24 30) (See section 2.5.2.)
- Develop a policy to ensure that expertise communicated to your on scene representatives and contractors is shared with the full incident command. (R-24-31) (See section 2.5.3.)

In addition, the NTSB reiterates the following recommendation to Norfolk Southern Railway:



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- Install in all controlling locomotive cabs and cab car operating compartments crash and fire protected inward and outward facing audio and image recorders. The devices should have a minimum 12 hour continuous recording capability. (R-13-26)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-28 through -31 and reiterated Safety Recommendation R-13-26). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

All communications regarding safety recommendations are stored by the NTSB and viewable by the public. Please do not send privileged or confidential communications in response to these recommendations. Responses marked as confidential or privileged (or similar designations) will be considered nonresponsive. In the likely event that your company uses auto generated and/or preformatted confidentiality statements on letterhead or outgoing e-mails, please include a statement in your letter indicating that the information can be publicly released. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov).

From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.3.2 Communication and Consist Information

The NS Cleveland East dispatcher confirmed that the crew of train 32N had experienced an emergency about 8:56 p.m. Emergency responders made their first request for consist information about 9:04 p.m. by calling the NS dispatch center in Atlanta, Georgia, which did not provide the requested information at that time. Consist information did not reach emergency responders until shortly before 10:00 p.m., when the NS regional hazardous materials manager emailed the consist to the CCEMA director while driving to the scene. About the same time, phone calls were taking place between NS personnel, the EPFD fire chief, and the incident commander. Through these calls, the incident commander became aware of two hazardous materials in the consist: benzene and VCM. After 10:00 p.m., consist information spread piecemeal through responding agencies and personnel. In interviews with the NTSB, emergency responders reported issues with radio interoperability and characterized the overall incident command as fractured or chaotic. Not until about 11:00 p.m., at the recommendation of the Ohio State Patrol, did the EPFD deputy fire chief, acting as the incident commander, issue a 1-mile evacuation—the distance recommended by the 2020 ERG for fires involving tank cars transporting VCM or isobutylene. 127 About the same time, NS personnel and contractors began arriving on the scene and recommending that firefighters redeploy to safer distances. Firefighters suspended fire suppression activities and relocated to safer positions around midnight on February 4. As part of the movement to safer locations, the deputy fire chief moved the command post to the combined police and fire station about a mile from the derailment site.

The emergency response effort involved many agencies from multiple jurisdictions and three states. The two hazardous materials teams dispatched to the scene—the East Liverpool and Beaver County teams—were unable to establish radio communications with the incident commander or other EPFD personnel, and concerns about radio communication led the Beaver County director of emergency services to share hazardous materials information with Beaver County fire departments directly in the expectation that radio issues might otherwise prevent them from receiving that information. The East Liverpool fire chief addressed the lack of radio interoperability by assigning personnel from his own team to stay in the command post so that his radio communications could reach other personnel stationed there.

These approaches to overcoming lack of interoperability reflect ingenuity and awareness of risk in the face of a challenging situation. However, reliance on face-to-face communications and lack of common channels to support interoperability reduce the efficiency of information sharing. The NTSB concludes that because there were not common radio channels between all responding agencies, the emergency response lacked efficient coordination.

Interoperability is a goal set by the 2019 NECP, the national roadmap for ensuring effective communications under NIMS. The standards and methods described in the 2019 NECP and integrated into the overall NIMS doctrine remain the preferred approach to ensuring efficient, effective communication between emergency responders, and the fundamentals of interoperability are addressed in the associated training courses. CISA maintains a regularly updated list of federal financial assistance programs intended to support investment in emergency communications.<sup>128</sup>



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The NTSB is concerned that complete and accurate consist information was not quickly and clearly communicated to the incident command after East Palestine dispatch contacted NS by phone and requested it. The slow provision of consist information to a single point of contact, followed by partial information provided over the phone to the incident commander, and then the slow distribution among responding agencies, delayed the evacuation to the ERG-recommended distance and protracted the time firefighters spent responding to an unknown set of hazards. Slow transmittal and distribution also delayed the Ohio State Patrol's recommendation to the incident commander that the shelter-in-place order be replaced by an evacuation, the response recommended in the 2020 ERG. The NTSB concludes that the delayed transmittal of consist information by NS to emergency responders needlessly increased the time emergency responders spent near the derailment pileup and delayed the evacuation order, resulting in unnecessary and increased exposure of emergency responders and the public to postderailment hazards.

In response to this accident, NS began integrating its emergency response notification process with RapidSOS, a digital platform designed to provide emergency responders with real-time consist information and notify NS of 911 calls reporting track emergencies in NS's rail network. This change is intended to make consist information available to first responders sooner and allow NS to begin responding to emergencies as soon as 911 calls are made. However, these changes may not address the specific problem present at East Palestine: an incoming request for information from a dispatch center remaining unanswered. The NTSB recommends that NS review and revise its procedures to immediately provide emergency responders with an accurate copy of the train consist upon becoming aware of an accident. The NTSB recommends that CCEMA adopt a policy to, upon receipt of a train consist, immediately provide it to the incident commander and all appropriate response agencies and departments. The NTSB also recommends that CCEMA update its Emergency Operations Plan, Hazardous Materials Response Plan, and Hazard Mitigation Plan, as appropriate, with lessons learned from the East Palestine derailment and fire, including, at a minimum, coordination among response agencies, communications, requests for and distribution of the train consist, staging and availability of equipment and other resources, and training for emergency responders.

The NTSB has investigated other accidents involving consist availability, including the July 10, 2005, collision and derailment of two Canadian National Railway Company freight trains in Anding, Mississippi, that resulted in four train crewmember fatalities, the release of 15,000 gallons of diesel fuel that burned for about 15 hours, and the evacuation of 100 residents (NTSB 2007). Seven tank cars containing hazardous materials residue derailed. The NTSB found that the railroad did not have the capability to provide first responders with consist information for one of the trains after the on-board copy was destroyed, and that this prevented emergency responders from promptly identifying the hazardous materials involved. The NTSB recommended that PHMSA: With the assistance of the Federal Railroad Administration, require that railroads immediately provide to emergency responders accurate, real-time information regarding the identity and location of all hazardous materials on a train. (R-07-4) 129

On January 22, 2008, in a response to Safety Recommendation R-07-4, PHMSA indicated to the NTSB that it was examining (1) ways to improve the availability of accurate and immediate information for emergency responders on the scene of an accident and (2) strategies for enhancing emergency response planning and training efforts. Additionally, PHMSA indicated that it was evaluating the emergency response issues raised in the safety recommendation and the federal, state, and local government and industry programs intended to address those issues. Based on PHMSA's communications, the NTSB classified Safety Recommendation R-07-4 Open—Acceptable Response.

On March 2, 2012, we reiterated Safety Recommendation R-07-4 as a result of our investigation of the June 19, 2009, derailment of a Canadian National Railway Company ethanol unit train in Cherry Valley, Illinois (NTSB 2012b).<sup>130</sup> Our investigation determined that the original consist for the train had only 3 of the 76 cars in their proper positions. Because this was a unit train, all loaded tank cars were transporting ethanol. We found that: The inaccurate train consist carried by the crew did not affect the emergency response to this accident; however, had a mixture of hazardous commodities been involved, the inaccurate consist information could have hampered the response effort or put the safety of emergency responders and others at risk. (NTSB 2012b)

On September 6, 2013, PHMSA published an advance notice of proposed rulemaking, titled "Hazardous Materials: Rail Petitions and Recommendations to Improve the Safety of Railroad Tank Car Transportation" (78 Fed. Reg. 54849). In our December 5, 2013, response, we noted our ongoing investigation of the November 30, 2012, derailment of a Conrail freight train that released VCM in Paulsboro, New Jersey. The NTSB convened an Investigative Hearing on July 9–10, 2013, where emergency responders testified that their response actions were hindered by the lack of timely and accurate train consist information. Noting both the positive steps proposed by PHMSA and this hearing testimony, we commented: However, we are very disappointed that Safety Recommendation R-07-4 has remained open for more than 5 years. The NTSB is encouraged by the PHMSA Hazardous Materials Automated Cargo Communications for Efficient and Safe Shipments program (HM-ACCESS) and notes that PHMSA has instituted a paperless hazard



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communication pilot program to evaluate the feasibility and effectiveness of paperless electronic communication systems. Pending completion of the recommended action, the NTSB has classified Safety Recommendation R-07-4 “Open—Acceptable Response.”

In our investigation of the Paulsboro derailment, we determined that the train consist and ERI were not provided to the incident command for more than 3 hours (NTSB 2014c). In our investigative report, we found that: During the early hours following the accident, Consolidated Rail Corporation personnel did not immediately provide critical hazardous materials information to emergency responders that could have assisted in executing a safer response to this accident. (NTSB 2014c).

We therefore reiterated Safety Recommendation R-07-4. In our August 26, 2014, letter to PHMSA, we noted that we believed available technologies could and should be used to supplement the paper-based train consist for improving the dissemination of chemical hazard information to emergency responders.

On May 23, 2023, we sent a letter to PHMSA regarding the lack of an NPRM or final rule requiring real-time consist notifications and observing that other than a January 19, 2017, advance notice of proposed rulemaking that had not led to a final rule, PHMSA had not taken action to address Safety Recommendation R-07-4 (82 Fed. Reg. 6451). We therefore classified Safety Recommendation R-07-4 Open—Unacceptable Response.

On June 27, 2023, partially in response to this safety recommendation and following the East Palestine derailment, PHMSA issued an NPRM titled “Hazardous Materials: FAST Act Requirements for Real-Time Train Consist Information,” proposing amendments to its rules for hazard communication. The proposed rule would require Class I railroads to promptly provide consist information to nearby emergency responders in the event of a release or suspected release of hazardous materials.

On August 23, 2023, the NTSB commented on the proposed rule. 131 While pleased to see this NPRM, we noted three concerns: the proposed rule does not define “promptly”; notification depends on “the release or suspected release” of hazardous materials, not only an accident or incident involving a train carrying hazardous materials; and one version of the proposed rule would apply only to Class I railroads. Waiting to determine whether a release is “suspected” rather than merely possible could slow consist notification. Further, non-Class I railroads can experience hazardous materials releases. For example, the NTSB investigated a release involving a Class II railroad in June 2023 in Reed Point, Montana, when a Montana Rail Link freight train derailed 15 hazardous materials tank cars and released hazardous materials (molten sulfur and asphalt petroleum liquid) into the Yellowstone River.

On June 24, 2024, PHMSA published Final Rule HM-263, Hazardous Materials: FAST Act Requirements for Real-Time Train Consist Information, requiring that any Class I or II railroad transporting hazardous materials immediately contact the local PSAP and provide consist information when a train carrying hazardous materials is involved in an accident that will require a response from local response agencies (81 Fed. Reg. 52926). The final rule specifies that the consist information must be provided electronically in a form the PSAP can readily access. Class III railroads must either follow the same requirements as other railroads or develop their own plans for alternative means of providing consist information to local PSAPs or emergency response agencies. If using an alternative means, Class III railroads must prepare written plans and conduct annual tests to demonstrate that their plans are effective. Class I railroads have 1 year to comply with the new rule; Class II and III railroads have 2 years to comply.

We recognize that PHMSA has addressed the concerns we identified in our NPRM comments by creating a final rule that requires immediate consist notification following an accident, addresses all rail accidents involving hazardous materials trains that affect local response agencies, and applies to all railroads that transport hazardous materials. The NTSB concludes that PHMSA’s Hazardous Materials: FAST Act Requirements for Real-Time Train Consist Information addresses the safety concerns of Safety Recommendation R-07-4. The NTSB therefore classifies Safety Recommendation R-07-4 as Closed—Acceptable Action.

10/10/24

Addressee

Official Correspondence

73822



# Recommendation Report

2/3/2025 10:29:33 AM

-From John R. Fleps, Vice President- Safety: Prior to the derailment in East Palestine, NSRC and other rail carriers provided emergency responders with access to AskRail, a mobile application providing timely access to hazardous materials commodity information for trains moving across North America. AskRail functionality was further enhanced through a connection to Chemtrec, a 24-hour public service hotline for emergency responders. A new partnership between the Association of American Railroads (AAR) and Chemtrec following the February 3, 2024 derailment built on Chemtrec's integration into AskRail, making consist information available to emergency responders immediately after an accident. By contacting Chemtrec, any first responder or emergency response agency will be able to immediately access consist information for Norfolk Southern trains directly from AskRail.

Further, NSRC was the first railroad to partner with RapidSOS to further the availability of critical information for first responders in rare significant incidents. NSRC has successfully implemented the RapidSOS platform, which connects over 500 million devices and sensors to over 150,000 emergency responder agencies. This partnership enables NSRC to provide vital information proactively, including train cargo contents, hazardous materials information, and emergency response standards in near realtime following an event. Among other RapidSOS capabilities demonstrated during your visit to NSRC's headquarters in July 2024, RapidSOS provides functionality for first responders to digitally request mutual aid from surrounding agencies in the event of a hazardous materials release. NSRC successfully utilized RapidSOS to deploy consist information to first responders for minor mainline train accidents in 2024, demonstrating the value of this important technological improvement to quickly disseminate information to emergency responders.

Finally, NSRC is also revising its hazardous materials operating rules (HM-1) to augment the longstanding requirement that train crews must immediately share train consist information with requesting emergency responders. Going forward, train crews will provide not just copies of the paper consist in the event of an incident, but the HM-1 rules will also contain instructions for crews to share the train consist electronically from a crew member's Mobile Trail Reporting mobile device.



# Recommendation Report

2/3/2025 10:29:33 AM

**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                         |          |                        |                                  |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                               | R-24-029 | <b>Overall Status:</b> | Open - Initial Response Received | CLASS II |
| TO NORFOLK SOUTHERN CORPORATION: Update your submissions to the Pipeline and Hazardous Materials Safety Administration's Incident Database to accurately reflect the cause of package failures following the East Palestine derailment. |          |                        |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                 | 1        |                        | <b>Overall Date Closed:</b>      | N/A      |

|                   |                              |                                  |                     |     |
|-------------------|------------------------------|----------------------------------|---------------------|-----|
| <b>Addressee:</b> | Norfolk Southern Corporation | Open - Initial Response Received | <b>Date Closed:</b> | N/A |
|-------------------|------------------------------|----------------------------------|---------------------|-----|

|                 |      |                    |       |
|-----------------|------|--------------------|-------|
| <b>07/12/24</b> | NTSB | Transmittal Letter | 73264 |
|-----------------|------|--------------------|-------|

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 cause 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 any accident or event investigated by the agency. 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 attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-028, R-24-029, R-24-030, and R-24-031). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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ExecutiveSecretariat@ntsb.gov.

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We are providing the following information to urge Norfolk Southern Railway to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to Norfolk Southern Railway. Additional information regarding these recommendations can be found in the noted sections of the report.

- Review and revise your procedures to immediately provide emergency responders with an accurate copy of the train consist upon becoming aware of an accident. (R-24-28) (See section 2.3.2.)
- Update your submissions to the Pipeline and Hazardous Materials Safety Administration's Incident Database to accurately reflect the cause of package failures following the East Palestine derailment. (R-24-29) (See section 2.5.1.)
- Adopt policies to ensure that your emergency response contractors keep detailed records of information used to make decisions involving hazardous materials, and share this information with shippers, relevant chemical associations, and other entities that provide hazardous materials guidance. (R 24 30) (See section 2.5.2.)
- Develop a policy to ensure that expertise communicated to your on scene representatives and contractors is shared with the full incident command. (R-24-31) (See section 2.5.3.)

In addition, the NTSB reiterates the following recommendation to Norfolk Southern Railway:



# Recommendation Report

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- Install in all controlling locomotive cabs and cab car operating compartments crash and fire protected inward and outward facing audio and image recorders. The devices should have a minimum 12 hour continuous recording capability. (R-13-26)

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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.1 Polymerization

The NTSB obtained expert opinions on VCM polymerization from Oxy Vinyls' LaPorte plant technical manager and a chemistry professor at Indiana University. Based on their interviews, hearing testimony, and references to scientific literature, stabilized VCM—in the case of East Palestine, VCM packaged in tank cars in a low-oxygen environment—cannot polymerize when exposed to heat without the presence of an initiator (free radicals), and it cannot sustain a polymerization reaction without the continued introduction of free radicals, which are consumed during the polymerization process. In other words, a runaway polymerization reaction is not possible if the VCM is stabilized, and VCM will remain stabilized as long as it remains in a low-oxygen environment.

Previous NTSB investigations and PHMSA incident reports further support that stabilized VCM (that is, VCM in a low-oxygen environment) is unlikely to polymerize in a tank car. The NTSB has investigated seven rail accidents in which VCM tank cars released lading. These investigations are summarized in table 18.

No NTSB investigation of a VCM release from a tank car has identified evidence of polymerization. In the seven investigations summarized in table 18, four VCM releases (Glendora, Houston, Lewisville, and Muldraugh) resulted in explosions attributable to combustion. In the Livingston release, one tank car exploded as a result of thermal failure during exposure to an intense fire (a non-VCM tank car also exploded). In these five cases, released VCM ignited—sometimes explosively—but did not show signs of polymerization. In the Paulsboro release, the VCM spread as a vapor cloud and was exposed to atmospheric oxygen for an extended period but showed no signs of polymerization.<sup>150</sup> These releases suggest that VCM does not tend to polymerize in a tank car exposed to heat or even one breached by outside mechanical forces.

PHMSA maintains the Hazmat Incident Database, which contains information reported on Hazardous Materials Incident Report Form 5800.1. A database query for 1971 through 2023 identified 73 incidents involving UN1086 (stabilized VCM) in transportation.<sup>151</sup> Five reports from NS listed "polymerization" as the cause of package failure—the reports NS filed for the five VCM tank cars involved in East Palestine. These tank cars released lading through PRD activity and were breached with explosives during the vent and burn, not by polymerization. There were no other reports of polymerization in the event descriptions or cause of failure descriptions for the remaining 68 incidents.

The NTSB's analyses of on-scene observations cited by NS as signs of polymerization assess not only whether the observations were consistent with polymerization, but also whether a more probable explanation is sufficient to account for the observation. The two credible observations are PRD activity and tank temperature measurements, both discussed below.

The PRDs on the four VCM tank cars exposed to fire cycled for several hours before they stopped actuating. Based on the cessation of PRD activity and traces of a volatile organic compound (plausibly VCM) detected near the protective housing of OCPX80370 on February 5, 2023, the SPSI president believed that the PRD had become plugged with polymer (PVC), causing it to release small



amounts of vapor but not enough to combust. The presence of PVC within the PRD would have indicated that polymerization was occurring within the tank. However, the post-vent and burn examination of disassembled PRDs found no signs of foreign matter, such as PVC, obstructing their operation. As discussed in section 2.4.3.2, physical damage to the PRD from tank car OCPX80370 was adequate to explain an elevated start-to-discharge pressure. This PRD's valve stem was stuck closed, and the PRD would not actuate even at pressures above its specified start-to-discharge pressure. The condition of the PRD suggests that it was no longer functioning normally after being exposed to fire conditions and burning VCM during actuation, but that its observed behavior was unrelated to polymerization. The NTSB concludes that postaccident examinations, which found no solidified chemical matter blocking pressure relief devices and other tank car service equipment openings, do not indicate that a polymerization reaction occurred within any of the five VCM tank cars.

During postaccident testing, the other three testable PRDs (from tank cars TILX402025, OCPX80235, and OCPX80179) all began to leak or discharge below their specified start-to-discharge pressures because of physical damage. Two of these PRDs (OCPX80235 and OCPX80179) cycled during fire exposure and eventually ceased operation. Because PRD actuation is a function of pressure and pressure is a function of temperature, the NTSB was able to use the postaccident test pressures to determine a set of maximum temperatures for the lading in those two VCM tank cars in the hours before the vent and burn. (For OCPX80235, the highest temperature the lading could reach without actuating a PRD was about 136°F; for OCPX80179, about 150°F. See below for methodology.) Further, SPSI and SRS recorded temperature measurements for all five VCM tank cars while monitoring for a temperature increase that could indicate polymerization. If those measured temperatures remained below the deteriorated PRDs' start-to-discharge pressures, then the temperature of the lading alone would explain the cessation of PRD activity.

A PRD on a tank car transporting a liquefied compressed gas reaches its start-to-discharge pressure when the temperature of the lading increases, raising the lading's vapor pressure (which normally equals the internal tank pressure).<sup>152</sup> Yaws' Critical Property Data for Chemical Engineers and Chemists provides vapor pressure values for VCM at different temperatures (Yaws 2014). Based on those values, VCM vapor pressure rises with temperature along the curve shown in figure 30.

The lowest start-to-discharge pressure identified during postaccident testing of a PRD known to actuate during fire exposure and then cease was 122 psig (OCPX80235). This pressure corresponds to a lading temperature of about 136°F. For OCPX80179, the start-to-discharge pressure identified during testing was 149.7 psig, which corresponds to a temperature of about 150°F. Typical measured temperatures for tank cars OCPX80235 and OCPX80179 ranged from 62 to 67°F. Similar analysis applies to the PRD with an elevated start-to-discharge pressure (from tank car OCPX80370). Given that this PRD would not start to discharge at 275 psig during testing, the lading temperature would have to exceed 199°F to actuate the PRD. The highest measured temperature for this tank car was 139°F, indicating a pressure of about 128 psig—much too low to overcome the stuck valve stem. Therefore, lading temperatures (and therefore internal tank pressures) are sufficient to explain the cessation of PRD activity even for PRDs with reduced start-to-discharge pressures, and PRD activity is not indicative of polymerization.

NS and its contractors also interpreted tank car temperatures as signs of polymerization. At Oxy Vinyls' recommendation, SPSI and SRS collected regular tank car temperature measurements on February 5–6, 2023, using an infrared thermometer to monitor the exterior shell surfaces at points where the jacket and thermal protection blanket had been torn away in the derailment. The measured temperatures are listed in table 3. In discussions with the incident commander and the NTSB on scene, NS noted a 3°F increase in temperature for tank car OCPX80370 as an indication that polymerization was occurring. This increase to 138°F on the afternoon of February 5 was close to the highest temperature recorded on a tank car shell (139°F, measured during a brief fire under the tank car about midnight on February 5-6). Tank car OCPX80370 was the only tank car to show significant variations in temperature during monitoring.<sup>154</sup> The temperature for OCPX80370 is plotted in figure 31 (blue), along with a trendline (red).

According to information Oxy Vinyls provided the NTSB after the vent and burn, a runaway polymerization reaction would produce “a rapid, significant, and sustained increase in temperature and pressure.” The dashed red trendline in the figure shows a gradual decline instead. The surface temperature measurements therefore do not indicate exothermic polymerization in tank car OCPX80370. Measured variations in temperature were likely the result of environmental conditions and the limitations of the method used. Because of non-uniform heating caused by internal circulation and exposure of parts of the tank car shells to external fire, the ideal location to collect temperature measurements would have been from the tank car's thermometer well. But access to top fittings houses was hampered by fires and thermally damaged fittings, and infrared thermometer measurements were the only ones available for tank car OCPX80370. The SPSI president testified that he did not have confidence in the temperature readings because pieces of jacket or thermal protection blanket might have been interfering with attempts to take the temperature of the bare tank shell, meaning that not every measurement was taken from the intended part of the tank.



Tank car OCPX80370's generally elevated temperature relative to the other tank cars was likely a result of the tank car leaning against a burning hopper car for 2–3 days. The nearby fire may have slowed the cooling of the lading and compromised the accuracy of the temperature measurements; infrared thermometers cannot distinguish between radiated heat (the internal warmth of the tank car) and reflected heat (energy released by the hopper car fire and bounced off the tank car shell). Measured fluctuations in temperature were therefore likely the result of environmental conditions, heat being reflected from the tank car, and the limitations of the measurement method. Even discounting the effects of nearby external heat sources, temperature measurements of tank car OCPX80370 were consistent with cooling lading, not runaway polymerization. The NTSB concludes that the observed downward temperature trend in tank car OCPX80370 indicates that polymerization was not occurring within the tank car, contrary to the representation by NS and its contractors.

In fact, all four VCM tank cars that released material through PRDs must have reached temperatures significantly higher than 139°F during the postderailment fires and then cooled before SPSI and SRS began taking measurements. These tank cars were equipped with PRDs with start-to-discharge pressures of 247.5 psig. During the first releases, before burning VCM could have begun to impact PRD performance, the vapor pressure of the VCM within the four venting tank cars must therefore have reached a minimum of 247.5 psig, and the lading a corresponding minimum temperature of about 189°F. These four tank cars exceeded the highest temperature measured by SPSI without experiencing a runaway polymerization reaction: all four had cooled after the fires were largely extinguished on February 4, as documented in table 3.

Evidence available after the vent and burn also does not support polymerization. During the vent and burn, all five VCM tank cars expelled material, indicating that the cars were still under positive internal pressure. Oxygen and other contaminants therefore could not enter the tank cars before the vent and burn, and the VCM remained in a low-oxygen, stabilized environment not conducive to polymerization. As discussed above, PRDs recovered from all five tank cars did not contain obstructions of PVC, and examinations did not identify foreign matter obstructing their operation. Finally, Oxy Vinyls performed laboratory analyses on residue samples recovered from the interiors of the VCM tank cars. While these analyses did not definitively rule out the presence of PVC (VCM and PVC are chemically similar) they did not find evidence of PVC. The NTSB concludes that the VCM within the derailed DOT-105 tank cars remained in a stabilized environment until the vent and burn and did not undergo polymerization; the vent and burn procedure was not necessary to prevent a polymerization-induced tank rupture. NS's submissions to the PHMSA Incident Database incorrectly describe polymerization as a cause of package failure in all five VCM tank cars. The NTSB recommends that NS update its submissions to the PHMSA Incident Database to accurately reflect the cause of package failures following the East Palestine derailment.

|                                                                                                                                                                                                            |           |                         |       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|-------|
| 10/10/24                                                                                                                                                                                                   | Addressee | Official Correspondence | 73822 |
| -From John R. Fleps, Vice President- Safety: Consistent with this recommendation, NSRC revised and updated the Pipeline and Hazardous Materials Safety Administration's (PHMSA) form 5800 on July 9, 2024. |           |                         |       |



# Recommendation Report

2/3/2025 10:29:33 AM

**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                                                                                                       |                              |                                  |                                  |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                                                                                                             | R-24-030                     | <b>Overall Status:</b>           | Open - Initial Response Received | CLASS II |
| TO NORFOLK SOUTHERN CORPORATION: Adopt policies to ensure that your emergency response contractors keep detailed records of information used to make decisions involving hazardous materials, and share this information with shippers, relevant chemical associations, and other entities that provide hazardous materials guidance. |                              |                                  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                                                                                                               | 1                            |                                  | <b>Overall Date Closed:</b>      | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                                                                                                                     | Norfolk Southern Corporation | Open - Initial Response Received | <b>Date Closed:</b>              | N/A      |

**07/12/24** NTSB Transmittal Letter 73264

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- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
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From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.2 Quality of VCM Hazard Information

Sources of VCM hazard information referenced by NS and its contractors before the vent and burn included the 2020 ERG, Oxy Vinyls' SDS, and The Chlorine Institute's Pamphlet 171. The 2020 ERG and Oxy Vinyls' SDS both list polymerization as a hazard associated with VCM. However, the 2020 ERG and SDS guidance are both intended to address circumstances other than when the VCM is within the interior of a mechanically intact tank car. The SDS guidance is intended to address potential hazards to include industrial settings and other environments distinct from conditions incident to transportation. Given that the SDS is required by regulation to address a wide range of hazards and the 2020 ERG is intended as a quick-reference guide for initial responses to a variety of transportation-related incidents, it is reasonable to expect that both will include guidance that addresses a wide range of applications and requires further context and expertise to use effectively.

Pamphlet 171 includes guidance specifically for emergency response involving intact VCM tank cars. This guidance states that a pressure above 68 psig or a tank surface temperature reading "above ambient temperature" may be indicative of polymerization. While these statements are true—exothermic polymerization produces increases in temperature and pressure—they do not take into consideration other explanations of elevated temperatures and pressures and can lead the reader to incorrectly conclude polymerization is occurring. Further, Pamphlet 171 may bias the reader against more probable explanations by stating that increased temperature and pressure together mean that polymerization is "most likely occurring in the tank car." This statement is not true for an intact tank car that has been exposed to a fire or was otherwise externally heated. Further, temperature and pressure are correlated and therefore should not be treated as two separate signs of polymerization.

As discussed in section 2.5.1, expert opinion and historical evidence both indicate that dangerous polymerization of VCM is unlikely within an intact tank car. Pamphlet 171's claim that increases in temperature and pressure indicate that polymerization is "most likely" occurring in intact VCM tank cars is overstated and therefore misleading. NS and its contractors referred to Pamphlet 171 in addition to the Oxy Vinyls SDS and 2020 ERG while forming their initial judgments that polymerization was occurring within the derailed VCM tank cars. The NTSB concludes that language in The Chlorine Institute's Pamphlet 171 overstates the probability of VCM polymerization in scenarios where tank cars remain intact, likely leading those using the pamphlet during an emergency response effort to overestimate the likelihood of polymerization. Therefore, the NTSB recommends that The Chlorine Institute review and revise Pamphlet 171 to ensure that its safety messages about VCM polymerization in tank cars are accurate and adequately support determining whether a rail accident poses a risk of polymerization. The NTSB also recommends that Oxy Vinyls update the SDS for VCM to accurately reflect the potential risks of VCM and the hazards that increase such risks.

SPSI and SRS were Level 3 CHLOREP contactors vetted by The Chlorine Institute to provide expertise and a capable emergency response to chlorine incidents. CHLOREP is intended to provide emergency responders—including incident commands—with accurate information and chlorine industry expertise. The capabilities The Chlorine Institute requires for Level 3 contractors do not



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specifically include vent and burn decision-making, focusing instead on safe field transfer (transloading) of chlorine products from damaged packaging. The Chlorine Institute verifies these capabilities every 3 years.

As the president of SPSI told the NTSB in an interview, one of the reasons SPSI and SRS did not attempt transloading of VCM was concern that the product had already polymerized, making it unsafe to move regardless of the condition of the VCM tank cars' fittings. However, available evidence did not indicate polymerization, and polymerization had not occurred. SRS and SPSI did not correctly interpret evidence relevant to polymerization, recognize the limitations or inaccuracies of the available written guidance about VCM hazards, or make use of Oxy Vinyls' expert opinion that available evidence did not point to polymerization. The events at East Palestine show that knowledge of VCM chemistry sufficient to determine whether polymerization has occurred is relevant to the intended role of Level 3 CHLOREP contractors, which should be capable of transloading VCM whenever it is safe to do so and of providing accurate hazard information to the full incident command. The NTSB concludes that because Level 3 CHLOREP contractors are expected to provide advanced emergency response capabilities, including communicating expertise to other on-scene personnel and the transloading of VCM, these contractors should possess or know how to obtain enough technical knowledge to accurately assess how chemical hazards, such as polymerization, affect a safe response to a VCM incident. The NTSB recommends that The Chlorine Institute review and revise its CHLOREP training and verification programs to ensure that Level 3 contractors possess or can obtain enough technical knowledge of VCM to accurately assess and respond to chemical hazards like polymerization during a VCM incident.

Information recorded on the scene by emergency response contractors, notably the temperatures of the tank cars and the timing of PRD actuation, was relevant to determining whether written guidance was accurate and effective in supporting the emergency response. Fire-exposed VCM tank cars did exhibit elevated temperatures and pressures—which Pamphlet 171 states are indicators of likely polymerization—but later examinations found no evidence that polymerization had occurred. The NTSB concludes that information collected during real-world accidents is a vital resource in ensuring that hazardous materials guidance is suitable for supporting responses to transportation emergencies. The NTSB recommends that NS adopt policies to ensure that its emergency response contractors keep detailed records of information used to make decisions involving hazardous materials, and share this information with shippers, relevant chemical associations, and other entities that provide hazardous materials guidance.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |                         |       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|-------|
| 10/10/24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Addressee | Official Correspondence | 73822 |
| -From John R. Fleps, Vice President- Safety: NSRC's contracts routinely require contractors to preserve certain materials. Revisions to strengthen preservation requirements are being included in all new contracts and revised contracts with NSRC's emergency response contractors. This obligation is further enhanced through the consent decree entered into between NSRC, the U.S. DOJ, U.S. Department of Interior, and the U.S. Environmental Protection Agency (EPA), lodged on May 23, 2024 ("Consent Decree"). |           |                         |       |



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                           |          |                        |                                  |          |
|---------------------------|----------|------------------------|----------------------------------|----------|
| <b>Recommendation # :</b> | R-24-031 | <b>Overall Status:</b> | Open - Initial Response Received | CLASS II |
|---------------------------|----------|------------------------|----------------------------------|----------|

TO NORFOLK SOUTHERN CORPORATION: Develop a policy to ensure that the expertise of manufacturers and shippers of hazardous materials involved in transportation accidents or incidents is communicated to your on-scene representatives and contractors and shared with the full incident command.

|                         |   |                             |     |
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| <b># of Addressees:</b> | 1 | <b>Overall Date Closed:</b> | N/A |
|-------------------------|---|-----------------------------|-----|

|                   |                              |                                  |                     |     |
|-------------------|------------------------------|----------------------------------|---------------------|-----|
| <b>Addressee:</b> | Norfolk Southern Corporation | Open - Initial Response Received | <b>Date Closed:</b> | N/A |
|-------------------|------------------------------|----------------------------------|---------------------|-----|

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|-----------------|------|--------------------|-------|
| <b>07/12/24</b> | NTSB | Transmittal Letter | 73264 |
|-----------------|------|--------------------|-------|

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 cause 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 any accident or event investigated by the agency. 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 attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-028, R-24-029, R-24-030, and R-24-031). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

All communications regarding safety recommendations will be stored by the NTSB and viewable by the public. Please do not send privileged or confidential communications in response to this recommendation. Responses marked as confidential or privileged (or



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similar designations) will be considered nonresponsive. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov).

The National Transportation Safety Board (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.

We are providing the following information to urge Norfolk Southern Railway to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to Norfolk Southern Railway. Additional information regarding these recommendations can be found in the noted sections of the report.

- Review and revise your procedures to immediately provide emergency responders with an accurate copy of the train consist upon becoming aware of an accident. (R-24-28) (See section 2.3.2.)
- Update your submissions to the Pipeline and Hazardous Materials Safety Administration's Incident Database to accurately reflect the cause of package failures following the East Palestine derailment. (R-24-29) (See section 2.5.1.)
- Adopt policies to ensure that your emergency response contractors keep detailed records of information used to make decisions involving hazardous materials, and share this information with shippers, relevant chemical associations, and other entities that provide hazardous materials guidance. (R 24 30) (See section 2.5.2.)
- Develop a policy to ensure that expertise communicated to your on scene representatives and contractors is shared with the full incident command. (R-24-31) (See section 2.5.3.)

In addition, the NTSB reiterates the following recommendation to Norfolk Southern Railway:



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- Install in all controlling locomotive cabs and cab car operating compartments crash and fire protected inward and outward facing audio and image recorders. The devices should have a minimum 12 hour continuous recording capability. (R-13-26)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-28 through -31 and reiterated Safety Recommendation R-13-26). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

All communications regarding safety recommendations are stored by the NTSB and viewable by the public. Please do not send privileged or confidential communications in response to these recommendations. Responses marked as confidential or privileged (or similar designations) will be considered nonresponsive. In the likely event that your company uses auto generated and/or preformatted confidentiality statements on letterhead or outgoing e-mails, please include a statement in your letter indicating that the information can be publicly released. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov).

From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.3 Vent and Burn Communication and Justification

The vent and burn decision began with NS and its contractors interpreting an energetic PRD actuation on the afternoon of February 4, 2023, followed by cessation of PRD activity as a sign that VCM had polymerized and obstructed a PRD, causing a build up of pressure and then preventing the PRD from actuating again. According to the NTSB's interview with the SPSI president, on February 4, SPSI and NS were already "at a vent and burn" decision because of the unusual PRD activity and the polymerization hazard information in the 2020 ERG, Pamphlet 171, and SDS.

Starting on the morning of February 4, NS and its contractors had access to VCM expertise from Oxy Vinyls. Oxy Vinyls called into question the likelihood of polymerization. In a conference call with SPSI and NS on the afternoon of February 4, Oxy Vinyls personnel in Dallas, Texas, assessed a low probability of polymerization and recommended monitoring the tank cars' temperatures. Runaway exothermic polymerization would produce a rapid, sustained increase in temperature. This rapid, sustained increase in temperature was not occurring, as discussed in section 2.5.1.

On February 5, 2023, representatives from Oxy Vinyls arrived on the scene and met with SPSI and SRS personnel. During this meeting, the Oxy Vinyls logistics process supervisor explained the VCM stabilization process and that a lading temperature above 185°F could actuate a PRD but not introduce oxygen into the tank and destabilize the VCM. The Oxy Vinyl representatives indicated that they had never had a VCM incident lead to a BLEVE.

Despite this new information from Oxy Vinyls, NS and its contractors continued to respond to the situation as though the VCM was polymerizing. About 5:45 p.m. on February 5, 2023, after the meeting with Oxy Vinyls' on-scene representatives, SPSI and SRS contacted the incident commander and said that circumstances might require a vent and burn. This action demonstrated a focus on polymerization to the exclusion of alternatives even after Oxy Vinyls employees' initial judgment that polymerization was unlikely, and it ignored contradictory evidence: between 5:00 p.m. and 6:00 p.m., the measured temperature of the suspect tank car had fallen 2°F. The temperature continued to trend downward over the next day, as shown in figure 32. NS and its contractors continued to assert the necessity of a vent and burn when Oxy Vinyls' expert opinions and on-scene evidence should have led them to question their original focus on polymerization.

While NS and its contractors continued to advocate for a vent and burn, the on-scene Oxy Vinyls representatives conducted another conference call with the Oxy Vinyls team in Dallas. They reached a consensus that the available evidence did not indicate polymerization. By the time Oxy Vinyls met with SPSI at 7:00 p.m. on February 5, NS had begun preparations for the vent and burn. Oxy Vinyls shared its conclusions with SPSI, but SPSI did not reconsider its course of action, and neither SPSI nor NS shared Oxy Vinyls' conclusions with the rest of the incident command. The NTSB concludes that NS and its contractors continued to assert the necessity of a vent and burn after expert opinion and available evidence should have led them to re-evaluate their initial conclusions



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regarding polymerization.

Throughout these meetings and conversations, Oxy Vinyls had no contact with the incident commander or elements of the incident command other than through NS, SRS, and SPSI. Oxy Vinyls personnel expected NS and its contractors to relay information to the rest of the incident command. However, Oxy Vinyls' conclusions about the lack of polymerization were not relayed to the incident commander or other personnel in the incident command. There is no evidence that the incident command was aware that Oxy Vinyls was available as a source of expertise on VCM at any time up to the final vent and burn decision.

The incident commander, the EPFD fire chief, approved the vent and burn based on information from NS, SRS, and SPSI. The incident commander made his decision after two meetings on the afternoon of February 6, 2023. The first meeting involved the wider incident command and participation from entities not formally part of the incident command, such as the governors of Ohio and Pennsylvania. The second, smaller meeting involved only the incident commander, the Ohio Governor, and representatives from NS, SRS, and SPSI. Oxy Vinyls was not invited to or present at either meeting, and no attendees questioned the NS position that dangerous polymerization was occurring in the VCM tank cars.

The NTSB is concerned by the absence of Oxy Vinyls' opinions and information from the decision-making process. At the NTSB's Investigative Hearing, the Oxy Vinyls technical manager testified that he was confident that Oxy Vinyls' opinions were being relayed to the full incident command, but NS and its contractors were not doing so. 156 During the second meeting on February 6, NS and its contractors told the incident commander that if the temperature in a tank car reached 153–158°F, the result would be an uncontrolled polymerization reaction. 157 This temperature range is not contained in the written guidance referenced during the emergency response and does not correspond to information that Oxy Vinyls shared with NS or its contractors. NS stated that if a tank car temperature reached 150°F, NS and its contractors would have to cease any efforts to prevent an explosion. NS also gave the incident commander a 13-minute time limit on his decision, claiming that the vent and burn needed to be conducted by 3:00 p.m. to finish in daylight and to avoid an atmospheric inversion that would hamper dispersion of the vapor cloud. The charges for the vent and burn were detonated at 4:37 p.m. following a series of delays, indicating that 3:00 p.m. was not a hard deadline for the procedure.

NS's communications with the incident commander produced a heightened sense of urgency around the vent and burn; the incident commander testified at the NTSB's Investigative Hearing that he had to make a decision quickly to avoid catastrophic failure of a tank car. 158 These communications included incomplete and inaccurate information that pushed the incident commander toward approving the vent and burn. The NTSB concludes that NS and its contractors compromised the integrity of the vent and burn decision by creating unwarranted urgency and not communicating expert opinions and information completely and accurately to the incident commander. Without Oxy Vinyls to share its determinations, the incident commander did not have a basis to effectively question the immediate necessity of the vent and burn. The NTSB concludes that the absence of Oxy Vinyls' expertise from the formal incident command denied the incident commander relevant information necessary to make a fully informed decision about the vent and burn. The NTSB recommends that Oxy Vinyls develop a policy to ensure that expertise on chemicals manufactured and offered for transportation by Oxy Vinyls is communicated to and shared with the full incident command during transportation accidents or incidents. The NTSB also recommends that the American Chemistry Council and The Chlorine Institute advise their members of the circumstances of the East Palestine derailment and fire and the need for shippers to ensure their expertise is communicated to and shared with the full incident command.

Oxy Vinyls developed conclusions about polymerizations and shared them with NS and its contractors in the expectation that its expertise would be passed onto decision-makers and taken into consideration. The NTSB is concerned by NS's decision not to relay Oxy Vinyls' conclusions that contradicted its early judgments about polymerization to the incident commander. NS was aware of expert opinions that contradicted its own and those of its contractors and, by not relaying the information, denied the rest of the incident command a chance to weigh the dissenting opinions before making a final decision.

Several explanations for NS's sustained preference for the vent and burn are consistent with available evidence, including confirmation bias and the perceived safety risks of alternative means of unloading the VCM. The explanations presented here are possibilities, but the evidence did not support a determination of which of these explanations, if any, was the main reason for the sustained preference for the vent and burn.

Confirmation bias is defined by the American Psychological Association as "the tendency to gather evidence that confirms preexisting expectations, typically by emphasizing or pursuing supporting evidence while dismissing or failing to seek contradictory evidence" (American Psychological Association 2018). NS and its contractors arrived at a belief in the need for a vent and burn as early as the afternoon of February 4, and the subsequent pattern of dismissing contradictory evidence while interpreting ambiguous evidence as



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support for the original belief is consistent with confirmation bias. Confirmation bias does not explain NS's inaccurate communications with the incident commander, but it does account for NS's failure to use Oxy Vinyls' expertise effectively or to revise its original position as more facts became available.

On February 5, 2023, NS told the NTSB that it had considered and rejected alternative means of unloading the VCM tank cars: transloading, hot tapping, and flaring. Several tank cars had damaged fittings, such as melted aluminum components, that could have made transloading or flaring the VCM unsafe or impossible. Hot tapping would have required personnel to puncture the tank cars and work near damaged equipment during the unloading process, exposing personnel to risk. Of the alternatives considered on the scene, NS described the vent and burn as presenting the least safety risk to railroad personnel, which was one reason NS provided for preferring the vent and burn and using the procedure on all five VCM tank cars instead of only the tank car with an elevated temperature (OCPX80370).

However, NS overlooked an alternative option: allowing the tank cars to finish cooling, then taking additional time to complete an assessment of each tank car's condition. When interviewed by the NTSB, the incident commander said he had been informed that the positions of the tank cars meant that venting and burning one would pose a risk to the others, and that venting and burning all five simultaneously was appropriate as a safety precaution. But a sixth tank car, a derailed DOT-105 tank car carrying isobutylene, a flammable gas in the same hazard class and division as VCM, was located closer than the four cooler VCM tank cars to tank car OCPX80370. The isobutylene tank car was therefore also closer to the vent and burn procedure performed on OCPX80370. The isobutylene tank car was not vented and burned, and it was successfully moved on February 7 and transloaded on February 23 following a damage assessment, which suggests that the nearby vent and burn did not render it unsafe to handle or unload. By performing a vent and burn of all five VCM tank cars on February 6, NS denied itself the option of assessing the structural condition and fittings of the VCM tank cars with the same thoroughness it applied to the isobutylene tank car.

The NTSB concludes that, no explanation or argument for NS and its contractors' continued advocacy for the vent and burn procedure justifies failing to communicate relevant expertise and dissenting opinions to the incident commander. The NTSB recommends that NS develop a policy to ensure that the expertise of manufacturers and shippers of hazardous materials involved in transportation accidents or incidents is communicated to its on-scene representatives and contractors and shared with the full incident command.

| 10/10/24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Addressee | Official Correspondence | 73822 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|-------|
| -From John R. Fleps, Vice President- Safety: In the Consent Decree, NSRC agreed to convene a "vent and burn working group" to establish coordination procedures for any future vent and burn event. NSRC also agreed to adopt procedures to ensure appropriate consultation with government agencies, first responders, unified command, and public health officials in advance of any proposed vent and burn procedure. Moreover, NSRC will be establishing standard protocols for consideration of public health and first responder safety, including communications with the public and other stakeholders that may be affected by the proposed vent and burn. Pursuant to the terms of the Consent Decree, NSRC is to provide the EPA with a draft procedure document within 18 months, with the goal of a final version within 24 months of the effective date of the Consent Decree. On June 21, 2024, NSRC announced it would establishment of the working group, which will be composed of leaders from across stakeholder groups who play a role in responding to rail accidents. The lessons learned from these activities will be utilized to improve the sharing of all expert information with incident command. |           |                         |       |



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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                             |  |                |                                  |  |                                  |          |
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| <b>Recommendation # :</b>                                                                                                                                                   |  | R-24-032       | <b>Overall Status:</b>           |  | Open - Initial Response Received | CLASS II |
| TO OXY VINYLS, LP: Update the safety data sheet for vinyl chloride monomer (VCM) to accurately reflect the potential risks of VCM and the hazards that increase such risks. |  |                |                                  |  |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                     |  | 1              |                                  |  | <b>Overall Date Closed:</b>      | N/A      |
| <b>Addressee:</b>                                                                                                                                                           |  | Oxy Vinyls, LP | Open - Initial Response Received |  | <b>Date Closed:</b>              | N/A      |

**07/12/24** NTSB Transmittal Letter 73264

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 cause 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 any accident or event investigated by the agency. 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.

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similar designations) will be considered nonresponsive. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov).

The National Transportation Safety Board (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.

We are providing the following information to urge Oxy Vinyls, LP to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to Oxy Vinyls, LP. Additional information regarding these recommendations can be found in the noted sections of the report.

- Update the safety data sheet for vinyl chloride monomer (VCM) to accurately reflect the potential risks of VCM and the hazards that increase such risks. (R-24-32) (See section 2.5.2.)
- Develop a policy to ensure that expertise on chemicals manufactured and offered for transportation by Oxy Vinyls is communicated to and shared with the full incident command during transportation accidents or incidents. (R-24-33) (See section 2.5.3.)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-32 and -33). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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privileged or confidential communications in response to these recommendations. Responses marked as confidential or privileged (or similar designations) will be considered nonresponsive. In the likely event that your company uses auto generated and/or preformatted confidentiality statements on letterhead or outgoing e-mails, please include a statement in your letter indicating that the information can be publicly released. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov).

From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

## 2.5.2 Quality of VCM Hazard Information

Sources of VCM hazard information referenced by NS and its contractors before the vent and burn included the 2020 ERG, Oxy Vinyls' SDS, and The Chlorine Institute's Pamphlet 171. The 2020 ERG and Oxy Vinyls' SDS both list polymerization as a hazard associated with VCM. However, the 2020 ERG and SDS guidance are both intended to address circumstances other than when the VCM is within the interior of a mechanically intact tank car. The SDS guidance is intended to address potential hazards to include industrial settings and other environments distinct from conditions incident to transportation. Given that the SDS is required by regulation to address a wide range of hazards and the 2020 ERG is intended as a quick-reference guide for initial responses to a variety of transportation-related incidents, it is reasonable to expect that both will include guidance that addresses a wide range of applications and requires further context and expertise to use effectively.

Pamphlet 171 includes guidance specifically for emergency response involving intact VCM tank cars. This guidance states that a pressure above 68 psig or a tank surface temperature reading "above ambient temperature" may be indicative of polymerization. While these statements are true—exothermic polymerization produces increases in temperature and pressure—they do not take into consideration other explanations of elevated temperatures and pressures and can lead the reader to incorrectly conclude polymerization is occurring. Further, Pamphlet 171 may bias the reader against more probable explanations by stating that increased temperature and pressure together mean that polymerization is "most likely occurring in the tank car." This statement is not true for an intact tank car that has been exposed to a fire or was otherwise externally heated. Further, temperature and pressure are correlated and therefore should not be treated as two separate signs of polymerization.

As discussed in section 2.5.1, expert opinion and historical evidence both indicate that dangerous polymerization of VCM is unlikely within an intact tank car. Pamphlet 171's claim that increases in temperature and pressure indicate that polymerization is "most likely" occurring in intact VCM tank cars is overstated and therefore misleading. NS and its contractors referred to Pamphlet 171 in addition to the Oxy Vinyls SDS and 2020 ERG while forming their initial judgments that polymerization was occurring within the derailed VCM tank cars. The NTSB concludes that language in The Chlorine Institute's Pamphlet 171 overstates the probability of VCM polymerization in scenarios where tank cars remain intact, likely leading those using the pamphlet during an emergency response effort to overestimate the likelihood of polymerization. Therefore, the NTSB recommends that The Chlorine Institute review and revise Pamphlet 171 to ensure that its safety messages about VCM polymerization in tank cars are accurate and adequately support determining whether a rail accident poses a risk of polymerization. The NTSB also recommends that Oxy Vinyls update the SDS for VCM to accurately reflect the potential risks of VCM and the hazards that increase such risks.

SPSI and SRS were Level 3 CHLOREP contractors vetted by The Chlorine Institute to provide expertise and a capable emergency response to chlorine incidents. CHLOREP is intended to provide emergency responders—including incident commands—with accurate information and chlorine industry expertise. The capabilities The Chlorine Institute requires for Level 3 contractors do not specifically include vent and burn decision-making, focusing instead on safe field transfer (transloading) of chlorine products from damaged packaging. The Chlorine Institute verifies these capabilities every 3 years.

As the president of SPSI told the NTSB in an interview, one of the reasons SPSI and SRS did not attempt transloading of VCM was concern that the product had already polymerized, making it unsafe to move regardless of the condition of the VCM tank cars' fittings. However, available evidence did not indicate polymerization, and polymerization had not occurred. SRS and SPSI did not correctly interpret evidence relevant to polymerization, recognize the limitations or inaccuracies of the available written guidance about VCM hazards, or make use of Oxy Vinyls' expert opinion that available evidence did not point to polymerization. The events at East Palestine show that knowledge of VCM chemistry sufficient to determine whether polymerization has occurred is relevant to the intended role of Level 3 CHLOREP contractors, which should be capable of transloading VCM whenever it is safe to do so and of providing accurate hazard information to the full incident command. The NTSB concludes that because Level 3 CHLOREP contractors are expected to provide advanced emergency response capabilities, including communicating expertise to other on-scene personnel and the transloading of VCM, these contractors should possess or know how to obtain enough technical knowledge to



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accurately assess how chemical hazards, such as polymerization, affect a safe response to a VCM incident. The NTSB recommends that The Chlorine Institute review and revise its CHLOREP training and verification programs to ensure that Level 3 contractors possess or can obtain enough technical knowledge of VCM to accurately assess and respond to chemical hazards like polymerization during a VCM incident.

Information recorded on the scene by emergency response contractors, notably the temperatures of the tank cars and the timing of PRD actuation, was relevant to determining whether written guidance was accurate and effective in supporting the emergency response. Fire-exposed VCM tank cars did exhibit elevated temperatures and pressures—which Pamphlet 171 states are indicators of likely polymerization—but later examinations found no evidence that polymerization had occurred. The NTSB concludes that information collected during real-world accidents is a vital resource in ensuring that hazardous materials guidance is suitable for supporting responses to transportation emergencies. The NTSB recommends that NS adopt policies to ensure that its emergency response contractors keep detailed records of information used to make decisions involving hazardous materials, and share this information with shippers, relevant chemical associations, and other entities that provide hazardous materials guidance.

|          |           |                         |       |
|----------|-----------|-------------------------|-------|
| 10/10/24 | Addressee | Official Correspondence | 73819 |
|----------|-----------|-------------------------|-------|



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-From Karenanne R. Stegmann, Vice President- Supply Chain: I am writing on behalf of Oxy Vinyls, L.P. ("Oxy Vinyls" or "Company") in response to your July 12, 2024 letter in connection with the above-referenced safety recommendations by the National Transportation Safety Board ("NTSB").

As an initial matter, please know that Oxy Vinyls appreciated the opportunity to work with the NTSB and other parties in connection with the NTSB's investigation into the Norfolk Southern Railway ("NS") train derailment in East Palestine, Ohio, that occurred on February 3, 2023. We share the NTSB's objective in preventing similar incidents in the future.

We want to acknowledge receipt of NTSB Safety Recommendations R-24-32 and R-24-33, which the NTSB directed to Oxy Vinyls. This letter describes the actions that Oxy Vinyls intends to take to implement these recommendations. We were pleased to have had the opportunity to discuss these proposed actions with the NTSB's Office of Safety Recommendations and Communications.

Before discussing the Company's implementation plan, it is important to provide context on the purpose of a safety data sheet ("SDS") and the federal regulatory requirements that prescribe their content and format.<sup>1</sup> As the NTSB is aware from its investigation, the Occupational Safety and Health Administration ("OSHA") has issued a standard for hazard communication. 29 C.F.R. § 1910.1200. An SDS is one aspect of the mandated hazard communication program.

An SDS is intended to convey comprehensive and general hazard information to a wide range of stakeholders (e.g., distributors, transporters, end users, emergency responders, and medical professionals, as well as the employees of the employer who manufactured the material). OSHA does not intend for an SDS to be a risk assessment document. Instead, the SDS provides information regarding the potential physical and chemical hazards of the material, including "possible" hazardous reactions that can occur in any number of scenarios—regardless of the degree of risk or likelihood of that scenario actually occurring.

SDS format and content, therefore, should not be misconstrued as being wholly within the control of Oxy Vinyls. Enhancing hazard communication is an industry-wide issue that necessarily requires the involvement of the agencies responsible for promulgating the broad hazard communication requirements as well as guidance on the "general" and "possible" hazards associated with certain chemicals, including VCM.

Oxy Vinyls is not an outlier in industry in its documentation of potential hazards. Oxy Vinyls' VCM SDS meets existing regulatory requirements and is consistent with available scientific literature. It is also consistent with VCM SDSs prepared by other companies and existing emergency response guidance, such as the Association of American Railroads ("AAR") Emergency Action Guide. This context is important, especially given that Oxy Vinyls' VCM SDS was not the basis for NS' decision to conduct the vent and burn operation.

Nonetheless, as a best practice and in furtherance of our commitment to continuous improvement, Oxy Vinyls will review its SDS in response to the NTSB's safety recommendation. Specifically, Oxy Vinyls will utilize a team of internal and external subject matter experts, including William Carroll, Ph.D.,<sup>2</sup> to review the VCM SDS and make updates if the team believes revisions are warranted.

As the NTSB is aware, the Chlorine Institute ("CI") also received a safety recommendation to "review and revise Pamphlet 171 to ensure that its safety messages about [VCM] polymerization in tank cars are accurate and adequately support determining whether a rail accident poses a risk of polymerization." NTSB Safety Recommendation R-24-25. Pamphlet 171 is one of the many external resources relevant to the Oxy Vinyls' VCM SDS.

We understand that CI is in the process of convening a task force of its members to review Pamphlet 171 in response to the NTSB recommendation.

Oxy Vinyls will promptly begin its review of the VCM SDS, however, final decisions regarding any enhancements to the SDS will necessarily be informed by CI's review of and any revision to Pamphlet 171. Accordingly, Oxy Vinyls proposes to complete its review of its VCM SDS by September 30, 2025, or sixty days after CI completes its review of and any revisions to Pamphlet 171, whichever is later.



# Recommendation Report

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**Product/Notation Id** 72568 / **Accident Date:** 02/03/23 **Issue Date:** 07/12/24  
**City/State:** East Palestine, OH **Accident #:** RRD23MR005 **Most Wanted List:** No

On February 3, 2023, about 8:54 p.m., eastbound Norfolk Southern Railway (NS) train 32N derailed 38 mixed freight railcars at milepost 49.5 on the NS Fort Wayne Line of the Keystone Division in East Palestine, Ohio. Three tank cars carrying flammable and combustible hazardous materials were mechanically breached during the derailment. A fire ignited during the derailment and grew to involve lading released from these three mechanically breached tank cars, additional derailed tank cars carrying both hazardous and non-hazardous materials, and freight cars. Emergency responders established a 1-mile evacuation zone that affected about 2,000 residents. The derailed equipment included five hazardous materials tank cars carrying vinyl chloride monomer (VCM), a compressed liquified flammable gas offered for shipment as "UN1086 vinyl chloride, stabilized, 2.1." The five VCM tank cars were not mechanically breached during the derailment, but over the next day, four of these tank cars were exposed to fires and released material from pressure relief devices. These releases ceased on the afternoon of February 4. Acting on information provided by NS and its contractors that a dangerous chemical reaction was occurring within a VCM tank car, the incident commander managing the response chose to expand the evacuation zone and perform a vent and burn (a deliberate breach of a tank car) on all five derailed VCM tank cars. The incident commander was not aware of dissenting opinions the VCM shipper had provided to NS and its contractors. A contractor hired by NS breached the VCM tank cars at 4:37 p.m. on February 6, releasing and igniting their lading. No injuries were reported during the derailment or emergency response.

|                                                                                                                                                                                                                                                |                |                                  |                             |                                  |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------|-----------------------------|----------------------------------|----------|
| <b>Recommendation # :</b>                                                                                                                                                                                                                      |                | R-24-033                         | <b>Overall Status:</b>      | Open - Initial Response Received | CLASS II |
| TO OXY VINYLS, LP: Develop a policy to ensure that expertise on chemicals manufactured and offered for transportation by Oxy Vinyls is communicated to and shared with the full incident command during transportation accidents or incidents. |                |                                  |                             |                                  |          |
| <b># of Addressees:</b>                                                                                                                                                                                                                        |                | 1                                | <b>Overall Date Closed:</b> |                                  | N/A      |
| <b>Addressee:</b>                                                                                                                                                                                                                              | Oxy Vinyls, LP | Open - Initial Response Received |                             | <b>Date Closed:</b>              | N/A      |

**07/12/24** NTSB Transmittal Letter 73264

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 cause 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 any accident or event investigated by the agency. 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 attached letter from the NTSB Chair provides information about the NTSB's June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendation may be found in the attached report, which can also be accessed at <http://www.nts.gov>. For more information about NTSB and our recommendation process, please see the attached one-page summary.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (for example, R-24-032 and R-24-033). We encourage you to submit your response to [ExecutiveSecretariat@nts.gov](mailto:ExecutiveSecretariat@nts.gov). If your reply exceeds 20 megabytes, including attachments, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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We are providing the following information to urge Oxy Vinyls, LP to act on the safety recommendations in this letter because we believe your organization can help reduce the risk of future accidents. For more information about the NTSB and our recommendation process, please see the attached one-page summary.

This letter also includes information about our June 25, 2024, report Norfolk Southern Railway Derailment and Hazardous Materials Release, East Palestine, Ohio, February 3, 2023. The details of this accident investigation and the resulting safety recommendations may be found in the attached report, which can also be accessed at <http://www.ntsb.gov>.

As a result of this investigation, we identified the following safety issues:

- Failure of wayside monitoring systems to diagnose a hot wheel bearing in time for mitigation to prevent a derailment;
- Inadequate emergency response training for volunteer first responders;
- Delayed transmittal of train consist information necessary to protect first responders and the public;
- Illegible hazardous materials placards that prevented emergency responders from immediately identifying hazards;
- Continued use of DOT 111 tank cars with documented poor derailment performance and lading retention in hazardous materials service;
- Tank car certification process insufficient to ensure that tank car fittings are compatible with lading;
- Misleading written hazard information that adversely affected the vent and burn decision; and
- Flawed communication and decision making leading up to the vent and burn.

Accordingly, the NTSB makes the following safety recommendations to Oxy Vinyls, LP. Additional information regarding these recommendations can be found in the noted sections of the report.

- Update the safety data sheet for vinyl chloride monomer (VCM) to accurately reflect the potential risks of VCM and the hazards that increase such risks. (R-24-32) (See section 2.5.2.)
- Develop a policy to ensure that expertise on chemicals manufactured and offered for transportation by Oxy Vinyls is communicated to and shared with the full incident command during transportation accidents or incidents. (R-24-33) (See section 2.5.3.)

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate a response within 90 days of the date of this letter, detailing the actions you have taken or intend to take to implement these recommendations. When replying, please refer to the safety recommendation by number (Safety Recommendations R-24-32 and -33). We encourage you to submit your response to [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov). If your reply, including attachments, exceeds 20 megabytes, please e mail us at the same address for instructions on how to send larger documents. Please do not submit both an electronic copy and a hard copy of the same response.

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privileged or confidential communications in response to these recommendations. Responses marked as confidential or privileged (or similar designations) will be considered nonresponsive. In the likely event that your company uses auto generated and/or preformatted confidentiality statements on letterhead or outgoing e-mails, please include a statement in your letter indicating that the information can be publicly released. If you have concerns about this protocol, please contact us at [ExecutiveSecretariat@ntsb.gov](mailto:ExecutiveSecretariat@ntsb.gov).

From the report RIR-24-05 "Norfolk Southern Railway Derailment and Hazardous Materials Release East Palestine, Ohio February 3, 2023" published on July 12, 2024:

### 2.5.3 Vent and Burn Communication and Justification

The vent and burn decision began with NS and its contractors interpreting an energetic PRD actuation on the afternoon of February 4, 2023, followed by cessation of PRD activity as a sign that VCM had polymerized and obstructed a PRD, causing a build up of pressure and then preventing the PRD from actuating again. According to the NTSB's interview with the SPSI president, on February 4, SPSI and NS were already "at a vent and burn" decision because of the unusual PRD activity and the polymerization hazard information in the 2020 ERG, Pamphlet 171, and SDS.

Starting on the morning of February 4, NS and its contractors had access to VCM expertise from Oxy Vinyls. Oxy Vinyls called into question the likelihood of polymerization. In a conference call with SPSI and NS on the afternoon of February 4, Oxy Vinyls personnel in Dallas, Texas, assessed a low probability of polymerization and recommended monitoring the tank cars' temperatures. Runaway exothermic polymerization would produce a rapid, sustained increase in temperature. This rapid, sustained increase in temperature was not occurring, as discussed in section 2.5.1.

On February 5, 2023, representatives from Oxy Vinyls arrived on the scene and met with SPSI and SRS personnel. During this meeting, the Oxy Vinyls logistics process supervisor explained the VCM stabilization process and that a lading temperature above 185°F could actuate a PRD but not introduce oxygen into the tank and destabilize the VCM. The Oxy Vinyl representatives indicated that they had never had a VCM incident lead to a BLEVE.

Despite this new information from Oxy Vinyls, NS and its contractors continued to respond to the situation as though the VCM was polymerizing. About 5:45 p.m. on February 5, 2023, after the meeting with Oxy Vinyls' on-scene representatives, SPSI and SRS contacted the incident commander and said that circumstances might require a vent and burn. This action demonstrated a focus on polymerization to the exclusion of alternatives even after Oxy Vinyls employees' initial judgment that polymerization was unlikely, and it ignored contradictory evidence: between 5:00 p.m. and 6:00 p.m., the measured temperature of the suspect tank car had fallen 2°F. The temperature continued to trend downward over the next day, as shown in figure 32. NS and its contractors continued to assert the necessity of a vent and burn when Oxy Vinyls' expert opinions and on-scene evidence should have led them to question their original focus on polymerization.

While NS and its contractors continued to advocate for a vent and burn, the on-scene Oxy Vinyls representatives conducted another conference call with the Oxy Vinyls team in Dallas. They reached a consensus that the available evidence did not indicate polymerization. By the time Oxy Vinyls met with SPSI at 7:00 p.m. on February 5, NS had begun preparations for the vent and burn. Oxy Vinyls shared its conclusions with SPSI, but SPSI did not reconsider its course of action, and neither SPSI nor NS shared Oxy Vinyls' conclusions with the rest of the incident command. The NTSB concludes that NS and its contractors continued to assert the necessity of a vent and burn after expert opinion and available evidence should have led them to re-evaluate their initial conclusions regarding polymerization.

Throughout these meetings and conversations, Oxy Vinyls had no contact with the incident commander or elements of the incident command other than through NS, SRS, and SPSI. Oxy Vinyls personnel expected NS and its contractors to relay information to the rest of the incident command. However, Oxy Vinyls' conclusions about the lack of polymerization were not relayed to the incident commander or other personnel in the incident command. There is no evidence that the incident command was aware that Oxy Vinyls was available as a source of expertise on VCM at any time up to the final vent and burn decision.

The incident commander, the EPFD fire chief, approved the vent and burn based on information from NS, SRS, and SPSI. The incident commander made his decision after two meetings on the afternoon of February 6, 2023. The first meeting involved the wider incident command and participation from entities not formally part of the incident command, such as the governors of Ohio and Pennsylvania. The second, smaller meeting involved only the incident commander, the Ohio Governor, and representatives from NS, SRS, and SPSI. Oxy Vinyls was not invited to or present at either meeting, and no attendees questioned the NS position that



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dangerous polymerization was occurring in the VCM tank cars.

The NTSB is concerned by the absence of Oxy Vinyls' opinions and information from the decision-making process. At the NTSB's Investigative Hearing, the Oxy Vinyls technical manager testified that he was confident that Oxy Vinyls' opinions were being relayed to the full incident command, but NS and its contractors were not doing so. 156 During the second meeting on February 6, NS and its contractors told the incident commander that if the temperature in a tank car reached 153–158°F, the result would be an uncontrolled polymerization reaction. 157 This temperature range is not contained in the written guidance referenced during the emergency response and does not correspond to information that Oxy Vinyls shared with NS or its contractors. NS stated that if a tank car temperature reached 150°F, NS and its contractors would have to cease any efforts to prevent an explosion. NS also gave the incident commander a 13-minute time limit on his decision, claiming that the vent and burn needed to be conducted by 3:00 p.m. to finish in daylight and to avoid an atmospheric inversion that would hamper dispersion of the vapor cloud. The charges for the vent and burn were detonated at 4:37 p.m. following a series of delays, indicating that 3:00 p.m. was not a hard deadline for the procedure.

NS's communications with the incident commander produced a heightened sense of urgency around the vent and burn; the incident commander testified at the NTSB's Investigative Hearing that he had to make a decision quickly to avoid catastrophic failure of a tank car. 158 These communications included incomplete and inaccurate information that pushed the incident commander toward approving the vent and burn. The NTSB concludes that NS and its contractors compromised the integrity of the vent and burn decision by creating unwarranted urgency and not communicating expert opinions and information completely and accurately to the incident commander. Without Oxy Vinyls to share its determinations, the incident commander did not have a basis to effectively question the immediate necessity of the vent and burn. The NTSB concludes that the absence of Oxy Vinyls' expertise from the formal incident command denied the incident commander relevant information necessary to make a fully informed decision about the vent and burn. The NTSB recommends that Oxy Vinyls develop a policy to ensure that expertise on chemicals manufactured and offered for transportation by Oxy Vinyls is communicated to and shared with the full incident command during transportation accidents or incidents. The NTSB also recommends that the American Chemistry Council and The Chlorine Institute advise their members of the circumstances of the East Palestine derailment and fire and the need for shippers to ensure their expertise is communicated to and shared with the full incident command.

Oxy Vinyls developed conclusions about polymerizations and shared them with NS and its contractors in the expectation that its expertise would be passed onto decision-makers and taken into consideration. The NTSB is concerned by NS's decision not to relay Oxy Vinyls' conclusions that contradicted its early judgments about polymerization to the incident commander. NS was aware of expert opinions that contradicted its own and those of its contractors and, by not relaying the information, denied the rest of the incident command a chance to weigh the dissenting opinions before making a final decision.

Several explanations for NS's sustained preference for the vent and burn are consistent with available evidence, including confirmation bias and the perceived safety risks of alternative means of unloading the VCM. The explanations presented here are possibilities, but the evidence did not support a determination of which of these explanations, if any, was the main reason for the sustained preference for the vent and burn.

Confirmation bias is defined by the American Psychological Association as "the tendency to gather evidence that confirms preexisting expectations, typically by emphasizing or pursuing supporting evidence while dismissing or failing to seek contradictory evidence" (American Psychological Association 2018). NS and its contractors arrived at a belief in the need for a vent and burn as early as the afternoon of February 4, and the subsequent pattern of dismissing contradictory evidence while interpreting ambiguous evidence as support for the original belief is consistent with confirmation bias. Confirmation bias does not explain NS's inaccurate communications with the incident commander, but it does account for NS's failure to use Oxy Vinyls' expertise effectively or to revise its original position as more facts became available.

On February 5, 2023, NS told the NTSB that it had considered and rejected alternative means of unloading the VCM tank cars: transloading, hot tapping, and flaring. Several tank cars had damaged fittings, such as melted aluminum components, that could have made transloading or flaring the VCM unsafe or impossible. Hot tapping would have required personnel to puncture the tank cars and work near damaged equipment during the unloading process, exposing personnel to risk. Of the alternatives considered on the scene, NS described the vent and burn as presenting the least safety risk to railroad personnel, which was one reason NS provided for preferring the vent and burn and using the procedure on all five VCM tank cars instead of only the tank car with an elevated temperature (OCPX80370).

However, NS overlooked an alternative option: allowing the tank cars to finish cooling, then taking additional time to complete an



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assessment of each tank car's condition. When interviewed by the NTSB, the incident commander said he had been informed that the positions of the tank cars meant that venting and burning one would pose a risk to the others, and that venting and burning all five simultaneously was appropriate as a safety precaution. But a sixth tank car, a derailed DOT-105 tank car carrying isobutylene, a flammable gas in the same hazard class and division as VCM, was located closer than the four cooler VCM tank cars to tank car OCPX80370. The isobutylene tank car was therefore also closer to the vent and burn procedure performed on OCPX80370. The isobutylene tank car was not vented and burned, and it was successfully moved on February 7 and transloaded on February 23 following a damage assessment, which suggests that the nearby vent and burn did not render it unsafe to handle or unload. By performing a vent and burn of all five VCM tank cars on February 6, NS denied itself the option of assessing the structural condition and fittings of the VCM tank cars with the same thoroughness it applied to the isobutylene tank car.

The NTSB concludes that, no explanation or argument for NS and its contractors' continued advocacy for the vent and burn procedure justifies failing to communicate relevant expertise and dissenting opinions to the incident commander. The NTSB recommends that NS develop a policy to ensure that the expertise of manufacturers and shippers of hazardous materials involved in transportation accidents or incidents is communicated to its on-scene representatives and contractors and shared with the full incident command.

| 10/10/24                                                                                                                                                                                                                                                                                               | Addressee | Official Correspondence | 73819 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|-------|
| <p>-From Karenanne R. Stegmann, Vice President- Supply Chain: I am writing on behalf of Oxy Vinyls, L.P. ("Oxy Vinyls" or "Company") in response to your July 12, 2024 letter in connection with the above-referenced safety recommendations by the National Transportation Safety Board ("NTSB").</p> |           |                         |       |

As an initial matter, please know that Oxy Vinyls appreciated the opportunity to work with the NTSB and other parties in connection with the NTSB's investigation into the Norfolk Southern Railway ("NS") train derailment in East Palestine, Ohio, that occurred on February 3, 2023. We share the NTSB's objective in preventing similar incidents in the future.

We want to acknowledge receipt of NTSB Safety Recommendations R-24-32 and R-24-33, which the NTSB directed to Oxy Vinyls. This letter describes the actions that Oxy Vinyls intends to take to implement these recommendations. We were pleased to have had the opportunity to discuss these proposed actions with the NTSB's Office of Safety Recommendations and Communications.

Oxy Vinyls Response:

As the NTSB is aware, the response to incidents in the United States is governed by the National Incident Management System ("NIMS"). Federal Emergency Management Administration, National Incident Management System (3d ed. 2017). NIMS is applicable to "all stakeholders with incident management and support responsibilities." Id. at 2. NIMS stakeholders include "emergency responders and other emergency management personnel, [non-governmental organizations ("NGOs")] (e.g., faith-based and community-based groups), the private sector, and elected and appointed officials responsible for making decisions regarding incidents." Id.

A critical aspect of NIMS (and by extension individual incident response) is "Communications and Information Management." Id. This component "describes systems and methods that help to ensure that incident personnel and other decision makers have the means and information they need to make and communicate decisions." Id. (emphasis added).

The timely dissemination of information is imperative within a Unified Command comprised of multiple individuals representing different organizations. Accordingly, NIMS provides that "each participating partner maintains authority, responsibility, and accountability for its personnel and other resources, and each member of Unified Command is responsible for keeping other members of Unified Command informed." Id. at 35 (emphasis added).

The NTSB concluded during its investigation that on three separate occasions, Oxy Vinyls communicated to NS and its emergency response contractors Oxy Vinyls' view that the stabilized VCM was not polymerizing. The NTSB found that NS and its contractors "compromised the integrity of the vent and burn decision by creating unwarranted urgency and not communicating expert opinions and information completely and accurately to the incident commander." NTSB, Norfolk Southern Railway Derailment and Hazardous Materials Release Railroad Investigation Report RIR-24-05 (June 25, 2024) at 170, Finding 32. NTSB further found that "[n]o explanation or argument for Norfolk Southern Railway and its contractors' continued advocacy for the vent and burn procedure justifies failing to communicate relevant expertise and dissenting opinions to the incident commander." Id. at 170, Finding 34.

It is inexplicable to Oxy Vinyls why NS—as a critical participant in the Unified Command—failed to communicate Oxy Vinyls'



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perspective to the incident commander. Oxy Vinyls acknowledges the intent of the NTSB recommendation to attempt to remedy such a failure to communicate, but the Company has concerns regarding the effectiveness of such a recommendation to a shipper such as Oxy Vinyls.

During this NTSB investigation, there was discussion regarding whether shippers should have a role in the Unified Command during transportation incidents. Shippers whose materials are involved in transportation incidents are often geographically remote from the incident scene, making it difficult to communicate directly with the full Unified Command. A shipper likely does not: (a) know the identity of the incident commander or other Unified Command staff; and (b) have contact information for those individuals. A shipper also may have reservations about contacting Unified Command staff who are in the middle of an emergency response (i.e., quite literally fighting the fire).

The most logical and appropriate flow of information remains shipper to carrier to Unified Command staff. Nonetheless, Oxy Vinyls recognizes the NTSB's efforts to establish a separate pathway if a carrier fails to communicate important information.

Prior to the incident, Oxy Vinyls had developed and implemented a Special Situation Plan ("SSP") to guide the Company's response to major incidents, including transportation incidents. It was pursuant to the SSP that Oxy Vinyls quickly assembled subject matter experts to provide technical support to NS and its emergency response contractors.

Oxy Vinyls is monitoring the response of the American Chemistry Council ("ACC") and CI to the similar recommendation that they received on this issue. The safety recommendation to ACC and CI recommends the following, "Advise your members of the circumstances of the East Palestine derailment and fire and the need for shippers to ensure their expertise is communicated to and shared with the full incident command." NTSB Safety Recommendation R-24-27. In revising the SSP, Oxy Vinyls will consider any best practices identified as a result of the efforts of ACC and CI.

Oxy Vinyls intends to complete its review and enhancement to its SSP by June 30, 2025, or sixty days after ACC and CI complete their response to NTSB Safety Recommendation R-24-27, whichever is later.



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