U.S. Department of Transportation
Federal Railroad Administration

FRA AUDIT REPORT

Norfolk Southern Railway Company

(NS) Class I

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Preface

The Federal Railroad Administration (FRA) is statutorily authorized to conduct inspections and investigations and issue reports concerning railroad operations but is not solely an auditing organization. Therefore, this performance audit does not strictly adhere to generally accepted government auditing standards. However, this performance audit was planned and performed to meet the stated audit objectives, obtain sufficient and appropriate evidence, and to provide a reasonable basis for the stated findings and conclusions.

Executive Summary

FRA is conducting systemwide special audits of railroads as part of its oversight obligations. In the second half of 2021, Norfolk Southern Railway Company (NS) had three unfortunate amputation accidents, and a year over year increase of 4.7% in total train accidents per million train miles.

Although employee injuries have decreased by 23% at NS and mainline accidents have decreased by 16%, several serious accidents and incidents did occur in 2021, including five involving conductor/brakemen who suffered amputations and other serious injuries between March and October 2021, alone. In contrast, NS experienced 3 such accidents in the entirety of 2020, and none in 2019. Two of the 2021 accidents involved conductors who had less than one year of service and occurred within one week of each other in October 2021. Then-Acting Administrator Bose sent NS a letter on October 28, 2021, highlighting the above accidents and incidents and noting FRA's concerns regarding deficiencies in the NS conductor certification training program submission. NS replied to that letter on November 8, 2021.

FRA conducted a system-wide, special audit of NS from January through early May 2022. During this special audit, FRA focused on seven discipline areas: Critical Incident Stress Plans, Hazardous Materials, Safety Partnerships, Motive Power & Equipment, Operating Practices, Signal & Train Control, and Track. Inspectors from each discipline conducted field work at times and locations determined by relevant characteristics of NS operations and were not present on NS property

constantly throughout the audit period. FRA's audit showed that in many aspects, NS programs are largely effective and compliant with relevant safety regulations. Still, NS has many opportunities to improve employee and manager awareness of and compliance with both FRA safety regulations and NS safety programs.

FRA provided NS an opportunity to review and comment on this audit report; NS provided comments on July 22, 2022. Where NS identified factual errors or additional information, FRA revised the text. Other comments are summarized and responded to where appropriate throughout the report.

Significant Findings

Of the seven discipline areas reviewed, FRA observed the most significant issues with the *Operating Practices* discipline. FRA observed inconsistencies in NS's operational testing and inspection program, ranging from access to and accuracy of records, to the methods and processes used to prioritize the testing of rules that prevent accidents. The failure to properly administer and implement the program of operational testing can diminish the capacity to correct accident/incident and injury trends. Furthermore, the recordkeeping system should not allow testing officers to record numbers of tests that cannot be verified. Without a properly administered program, NS could be hindered in monitoring conditions on the railroad or targeting resources successfully. FRA has met with NS management to discuss the findings that were brought to light during this audit and will follow up with NS through an audit of their program.

For *Critical Incident Stress Plans* (CISP), FRA found that most NS employees and managers are generally not aware of either the regulation or the NS CISP. As a result of managers' ignorance of NS' CISP provisions, they are unable to consistently provide the support to directly involved employees after a critical incident required under 49 CFR § 272.101. Delay in the provision of required relief and services could exacerbate symptoms of distress following a critical incident.

FRA's *Safety Partnerships Division* identified four findings, with the most significant being that NS did not provide a digital or hardcopy document of the tasks and related steps associated with

on-the-job training (OJT) exercises for its new-hire conductor employees. The failure to do so leaves conductor new hires without a reference for the steps necessary to adequately perform their OJT exercises.

FRA's *Motive Power and Equipment Division* found inadequate communication between the NS transportation and mechanical departments. The NS transportation department performed the required equipment inspections, but in certain cases either the defective conditions identified were not reported to the mechanical department for repair or the equipment was not removed from service until repairs could be made. This inadequate communication could expose crews to increased personal injury hazards and may raise the overall risk of train derailment.

FRA's *Hazardous Materials Division* noted that at several locations and dates during the audit, NS trains were observed with missing placards departing where a rail car containing a load or residue of a hazardous material was accepted or where that rail car was placed into a train.

Specifically, FRA observed nine defects and recommended four violations of 49 CFR § 174.9, and 41 defects of which one was recommended for violation of 49 CFR § 174.59. In these cases, NS employees failed to inspect rail cars containing a load/residue of a hazardous material at ground level for missing placards or failed to place or replace missing placards. In the event of an emergency, responders rely on the information on a placard to determine the proper response to a release of the hazardous material in question. Failure to provide this information by marking cars with appropriate placards could exacerbate the risks associated with the release to emergency responders, train crews, and members of the public.

FRA's *Signal, Train Control, and Crossings (S&TC) Division* found instances where NS had not updated numerous circuit plans in a timely fashion. In several locations near St. Louis, significant changes were made at one or more highway rail grade crossings (HRGCs), but the circuit plans had not been updated to show these changes. As a result of the failure to timely update the circuit plans, employees did not have current, accurate information, increasing the likelihood that they might put in place changes that could degrade the safe operation of the crossing warning system.

FRA's *Track Division* determined that there are deficiencies in the current NS Continuous Welded Rail (CWR) plan. Therefore, FRA is formally requesting a full review of the current CWR Plan.

This is based upon the appearance of inconsistent application of CWR procedures among NS workforces, and NS CWR records that do not all match the rail marking information in the field.

Audit Findings/Results by Discipline

Operating Practices

The objective of FRA's Operating Practices (OP) Division audit was to review NS's compliance with 49 CFR § 217.9, Program of Operational Tests and Inspections; Recordkeeping. That regulation requires that each applicable railroad must periodically conduct operational tests and inspections to determine the extent of compliance with its code of operating rules, timetables, and timetable special instructions, specifically including tests and inspections sufficient to verify compliance with the requirements of 49 CFR part 218, subpart F, in accordance with a written program. In particular, FRA's OP audit focused on the qualifications of the railroad testing officers, administration of the program, and recordkeeping.

During the week of April 18-22, 2022, FRA conducted an audit of four-yard locations: Enola/Harrisburg, PA, Atlanta and Macon, GA, and Bellevue, OH. These four locations were chosen because, in calendar year (CY) 2021, these operations were responsible for 15% of NS reportable human factor caused accidents and incidents.

Overall, FRA observed some inconsistencies in NS's operational testing and inspection program, ranging from access to and accuracy of records, to the methods and processes used to prioritize the testing of rules that prevent accidents. The failure to properly administer and implement the program of operational testing can diminish the capacity to correct accident/incident and injury trends. Furthermore, the recordkeeping system should not allow testing officers to record numbers of tests that cannot be verified.

Without a properly administered program, NS could be hindered in monitoring conditions on the railroad or targeting resources successfully. FRA has met with NS management to discuss the findings that were brought to light during this audit.

FRA notes that some encouraging and progressive measures already discussed are moving in a positive direction, and FRA is looking forward to the implementation of all the changes described. Additionally, FRA will initiate a proactive approach with a systemwide audit and, as part of the audit, verify the identified issues are addressed.

Finding 1: Qualifications of the Railroad Testing Officers Is Difficult to Validate.

FRA requires that each railroad officer who conducts operational tests and inspections (railroad testing officer) must meet certain qualifications and that the railroad retain records documenting those qualifications. For example, FRA requires that each railroad testing officer be qualified on the railroad's operating rules, be qualified on the operational testing and inspection program requirements and procedures relevant to the testing and inspections the officer will conduct, and receive appropriate field training, as necessary to achieve proficiency, on each operational test or inspection that the officer is authorized to conduct. 49 CFR § 217.9(b)(1)(i)-(iii). FRA requested a select number of records to review. The number of records provided were limited, and FRA observed that although NS stated that the records did exist, the records are not "centralized", impeding NS's ability to extract records. NS acknowledged this was problematic and are currently consolidating records to one location for sustainable access and management standards.

Finding 2: Program Administration: NS Cannot Verify the Types of Tests Administered, NS Failed to Identify/Test for a Significant Safety Issue, and FRA Observed Officers' Inaccurate Recording of Test Failures.

FRA requires that each railroad have a written program of operational tests and inspections under the various operating conditions on the railroad, and that the program address, with particular emphasis, those operating rules that cause or are likely to cause the most accidents or incidents as identified in mandated periodic reviews of the program. 49 CFR § 217.9(c). Further, FRA regulations requires the railroad testing officers to conduct operational tests and inspections per the railroad's operational tests and inspections program. 49 CFR § 217.9(b)(1)(iv).

FRA reviewed the NS program titled "RP-1 Supervisors Guidelines for Conducting Efficiency Checks" and the railroad's records to determine whether railroad testing officers were placing particular emphasis on those operating rules that cause or are likely to cause the most accidents or

incidents as identified in mandated periodic reviews of the program. FRA found that the NS program relies on a "scenario" based system from which a wide range of operating rules and tests can be chosen. RP-1 at 14-39. However, observing or testing for every rule listed in a scenario is not feasible. NS does not have procedures to know which rules were observed or which test or tests were performed. For example, the "EQUIPMENT OPERATION, HANDLING & INSPECTION" test includes 49 potential rules an officer can test for. NS could not explain or establish whether its railroad testing officers were placing particular emphasis on those operating rules that cause or are likely to cause the most accidents or incidents.

FRA also noted that the NS RP-1 program is unclear how each type of test or inspection is to be conducted. NS could not submit other documents or training materials that illustrate that each testing officer understands how to achieve proficiency in administering tests and inspections.

Finding 3: Failure to Identify and Test for Rules that Prevent Accidents Related to By-Passed Couplers.

Further to Finding 2 and related to compliance to 49 CFR § 217.9(c), FRA observed that NS did not conduct operational test at either Bellevue, OH, or Macon, GA to address human factor caused train accident prevention, specifically accidents related to by-passed couplers. Those two locations, however, account for 22% of NS system by-passed coupler accidents. No operational testing was recorded in either location related to the specific actions that resulted in by-passed coupler accidents. At Bellevue, OH, FRA was informed that testing for by-passed couplers was not required and therefore, not performed. Further the railroad's quarterly reviews of safety issues failed to acknowledge the growing trend for by-passed couplers at any location until the 1st Quarter 2022 review.

In its comments to the FRA, NS contended that "the increase in by-passed coupler incidents is not entirely attributable to rule compliance," and indicated that they will continue to engage with FRA in discussing the issue. FRA notes in response that NS revised the operating conditions at Bellevue, OH, and Macon, GA, in July and August of 2022, and looks forward to working with NS to ensure that human factor accidents attributable to by-passed couplers are appropriately addressed.

Finding 4: Undercounting and inadequately observing rules failures.

FRA's audit of railroad testing officers suggests they were undercounting and inadequately observing rules failures. The following are some examples of FRA's on-site audit observations:

a. At the audit locations, NS recorded the aggregate failure rate prior to the audit at 3.26%, and during the audit, the failure rate rose to 10.1%, a 210% difference. At the audit locations, the overall failure rate for testing observations made by NS supervisors unaccompanied by FRA inspectors differed significantly from when accompanied by FRA inspectors. The observations made by FRA conducting 217T (Observation of Railroad Testing Officers) inspection activity with railroad officers found 23 exceptions, which suggests that the failures due to rules non-compliance are underreported by the railroad. The failure rate when FRA accompanied railroad testing officers was 3.6%. In contrast, NS failure rate for railroad testing officers unaccompanied by FRA inspectors during the 4th Quarter of CY 2021 was 0.13%.

b. FRA observed 13 of 29 testing officers, i.e., 45%, to have either recorded observed rule failures improperly or failed to record them

c. NS supervisors failed to correctly report seven testing exceptions into the NS recordkeeping program for crewmembers who were observed not following the operating or safety rules. The failure to record test failures calls into question the accuracy of NS recordkeeping when not under FRA observation. FRA found NS only recorded 39 test failures at the four locations where FRA made its observations over the 4th quarter of CY 2021.

NS commented that this issue might have been related to the fact that their process at the time of the audit included supervisors providing informal corrections to employees regarding rule violations without recording those interactions; they are accordingly effecting a change to what is documented in order to capture the informal interactions. FRA believes that the lack of documentation for non-formal handling of violations presents a missed opportunity to document non-compliance and identify safety trends and looks forward to NS collecting more complete data and using it effectively.

A further example was observed in Atlanta and Macon, GA, where FRA found two violations. One was for having bottled air on a cut of cars and having an instruction stating it was allowed - § 232.103(n)(2). The other violation was for leaving a locomotive in the foul - § 218.101(b). The fact that the instruction bulletin, which had the effect of directing both regulatory and NS rules noncompliance was issued and left uncontested by railroad testing officers.

Finding 5: Number of Tests and Times of Tests Cannot Be Verified.

FRA requires that each railroad keep a record of the date, time, place, and result of each operational test and inspection that was performed in accordance with its program. Each record shall specify the officer administering the test and inspection and each employee tested. 49 CFR§ 217.9(d).

FRA's audit of NS operational testing and inspection procedures and recordkeeping system identified inconsistencies and potential for errors. The number of tests recorded at the subject locations appeared elevated. For example, during the 4th Quarter of CY 2021, NS reported nearly 36,000 observation tests at the four-yard locations audited. The testing volume was so great that some officers recorded more than 1,000 tests in the quarter. For instance, one officer recorded just shy of 2,000 tests in the quarter—a concerning number considering there are 92 days in a quarter, and that would mean that the officer was averaging approximately 22 tests every day if the officer worked every day of the quarter.

NS does not record the exact time a test is performed, although NS does record an observation period. It was observed that this observation period can last several minutes to 18 hours. Therefore, NS cannot verify that it performed rules testing at times that address the most common incident trends.

NS noted there is no right or wrong number of tests, and that they plan to engage in further discussions with FRA on this matter. FRA is working with NS to ensure that testing is conducted in a way to achieve and maintain a safe work environment.

Recommendations:

1. **Ensure railroad testing officers understand all requirements of the Operational Testing and Inspections program and maintain accurate records of qualifications.**

2. **Ensure and amend, where necessary, the Operational Testing and Inspections program to ensure compliance with all requirements of 49 CFR Part 217, including both the administration of the program, recordkeeping requirements and the requirement that operational testing and inspections prioritize rules that prevent accidents.**

3. **Ensure that testing officers understand procedures for administering and recording tests.**

Critical Incident Stress Plans (CISP)

The objectives of the Critical Incident Stress Plan (CISP), 49 CFR Part 272 audit were to determine if NS management and labor understand: (1) the requirements of the NS Part 272 CISP; (2) what is considered a critical incident under the regulation; (3) how to offer (management) and where to obtain (labor) post-incident resources and assistance; and (4) where to obtain a copy of the NS CISP. This portion of the audit is focused on the effectiveness of the NS CISP as currently implemented.

Finding 1: NS management and employees generally lack awareness of the NS CISP.

FRA interviewed 10 NS managers and about 60 employees. Interviews with NS managers, covered employees, and union representatives revealed a general lack of knowledge regarding: (1) the plan requirements under Part 272; (2) the definition of which employees are covered under Part 272; (3) what relief options are available to a covered employee after a critical incident; and (4) what support services are available to covered employees after a critical incident. Interviews revealed that some managers are following the spirit of the Part 272 regulation because it is "the right thing to do" and they are committed to ensuring employees are "taken care of" after a critical incident. However, they are apparently doing so without knowledge of regulatory requirements or the NS CISP plan; none of the interviewees were aware of or had attended any associated training. As a result, whether an employee is offered relief and access to appropriate support services after a critical incident may depend on what individual managers feel is appropriate.

In addition, employees expressed concerns that not only were they unaware of the provisions in Part 272 or that they would be considered covered employees under the NS CISP, but also that they were not provided access to timely relief after a critical incident, additional relief as necessary, or access to support services – even when requested. By delaying or failing to provide early access to support services for employees involved in critical incidents, there is an increased likelihood that those employees could experience worsening symptoms of distress following a critical incident, including potentially developing acute stress disorder or even post- traumatic

stress disorder (PTSD).[1]

Recommendations:

- **Ensure covered employees understand NS CISP program requirements, what to expect from the program following a critical incident, and what relief options are available after a critical incident.**
- **Develop and implement a program to increase awareness across the NS system regarding Part 272 requirements and the NS CISP plan.**
- **Ensure that managers comply with the requirements of the NS CISP.**
- **Create a training program for managers:**
    - **Include specific sections on Part 272 plan requirements, definitions of key terms including critical incident, directly involved employee, and covered employee, and penalties for non-compliance.**
    - **Include information on how to determine if an incident is a critical incident and what to do if unsure.**
    - **Provide information and examples of the steps that need to happen, according to the NS CISP plan, after a critical incident.**
    - **Provide information on the roles and responsibilities of those involved in a critical incident including not only the managers, dispatchers, and directly involved employees, but also any Peer Support and Employee Assistance Program (EAP) resources.**
    - **Include information on relief options available to covered employees.**

[1] For prevention of PTSD, the U.S. Department of Veterans Affairs recommends assessment and treatment beginning within 30 days of exposure. *See* U.S. Department of Veterans Affairs, VA/DOD Clinical Practice Guideline for the Management of Posttraumatic Stress Disorder and Acute Stress Disorder Version 3.0, 2017. Pp 5-11.

Finding 2: There is currently no system in place to track employee involvement in critical incidents.

Although a tracking system is not a regulatory requirement under Part 272, railroads that have implemented such systems as a best practice have found it provides better outcomes for covered employees and more consistent application of regulatory requirements by managers across their systems. A tracking system would allow managers the ability to review information on the number of previous incidents, how recently the last critical incident in which the employee was involved took place, and basic information (e.g., trespasser fatality, vehicle strike) about previous incidents. Managers and EAP providers could then use that information to help determine if additional time off, after initial relief from duty, might be necessary, and to determine how best to present available after-care options to the employee. In the absence of such a system, unless an individual manager is aware of previous incidents in which a covered employee was involved, managers may approach each incident as an isolated event. This ignores how involvement in previous critical incidents can exacerbate the severity of distress and trauma experienced after subsequent critical incidents and could result in a covered employee not being offered access to the necessary, appropriate after-care options required to assist in recovery after critical incident involvement.

Recommendations:

- **Document the basic information (name, date of incident, type of incident, etc.) for each employee involved in a critical incident regardless of whether that employee sought relief from the remainder of the duty tour or additional assistance.**
- **Document relief options and additional assistance provided for those employees in need of these resources as indicated in Part 272.**
- **Provide EAP personnel with access to information on accidents/incidents reportable under 49 CFR Part 225 so personnel can ensure both NS internal policies and Part 272 requirements are being correctly implemented.**

NS noted that the objectives of the CISP portion of the audit are not requirements under 49 CFR Part 272 and recommended that FRA delete the entire section. FRA's audit, however, was not focused on determining whether NS' plan was compliant with the regulation, but rather to identify whether it is effective. FRA identified specific actions NS could take to improve its program and is therefore leaving the section in place.

Hazardous Materials

The objectives of the Hazardous Materials portion of the audit were to determine NS compliance with 49 CFR Part 172, Subparts H & I; Part 174, Subparts A & B; Special Permits; and OT 55-R.

FRA's Hazardous Materials (HM) Division conducted its audit between April 4 and April 16, 2022, concluding at NS Headquarters in Atlanta, GA. The field inspections encompassed 50 locations throughout 17 States where NS operates. The HM Division reviewed NS compliance history over the past three years and examined the following in its field inspections:

Criteria

- Part 172, Subparts H-Training and I-Safety and Security
- Part 174, Subparts A-General Requirements and B-General Operating Requirements
- Special Permits (SP) e.g., SP 20996 (Distributed Power Unit Buffer Car Relief) SP-20954 (Electronic Train Consist), etc.
- OT-55-R Recommended Railroad Operating Practices for Transportation of Hazardous Materials

Inspection Locations

NS Major Yards – inbound and outbound trains including local trains

NS Interchange Yards – inbound and outbound trains

NS Off Hours – inspectors inspect yards in their local territory outside of normal duty hours

NS Headquarters Security Audit and Closeout – Atlanta, GA

The carrier's compliance history reveals that compliance with 49 CFR § 174.26, which requires train crews to maintain a paper document that accurately reflects the position of hazardous materials shipments within a train and has been the leading non-compliant item on FRA's hazmat

inspection reports for the NS. Adherence to the § 174.26 requirements for maintaining an accurate consist should become less of an issue with the advent of the DOT-SP 21110, allowing the use of electronic train consist information. NS has only implemented the authorized use of the DOT-SP 21110 on its Gulf and Coastal operations divisions. Other divisions are utilizing the tool "only as a means to become familiar with the new system." Therefore, FRA examined whether NS maintained paper documentation of consists as required on other NS divisions.

NS also has been granted authorization to utilize DOT-SP 20996, which authorizes the placement of most placarded railcars next to an unoccupied (DPU) locomotive for the entire system. As part of the compliance conditions of this SP, securement of these locomotives must be established to prevent occupancy while in use, and this condition was evaluated as part of the HM Division's activities. FRA observed compliance with these conditions during the audit.

FRA observed compliance with 49 CFR Part 174-Carriage by Rail Subpart A-General requirements section: § 174.14 Movements to be expedited. If railcars containing a hazardous material are not forwarded in a timely manner, delays could cause an undue hardship on the consignee due to material shortages; and in a worst-case scenario, delays could cause injury or death to employees or the general public, or environmental harm due to an unintentional release of hazardous materials that are time sensitive shipments. At locations where FRA made observations regarding this regulation, inspectors found no conditions where rail cars containing a hazardous material had exceeded the regulatory requirements for the dwell time. The carrier in these locations has a procedure in place to identify the dwell time of rail cars containing a hazardous material and implemented that procedure.

Title 49 CFR § 174.63 prohibits transporting portable tanks, Intermodal (IM) portable tanks, Intermediate Bulk Containers (IBCs), Large Packaging, cargo tanks, or multi-unit tank car tanks containing hazardous materials in Container-on-Flat-Car (COFC) or Trailer-on-Flat-Car (TOFC) service without specific permissions. FRA found no instances of noncompliance at observed locations. The carrier in these locations has a procedure in place to identify acceptable packages to be placed on a flat car for rail transportation.

During the carrier audit FRA inspectors only had the opportunity to observe the implementation of

Section III of the Association of American Railroads Circular No. OT-55-R "Recommended Railroad Operating Practices for Transportation of Hazardous Materials." Section III covers coupling speeds in rail yards. The carrier appeared to implement these recommended practices.

Finding 1: Inconsistent application of the requirement to inspect for and replace missing placards.

Pursuant to the requirements of 49 CFR Part 174-Carriage by Rail Subpart A-General requirements section:

§ 174.9 Safety and security inspection and acceptance

> At each location where a hazardous material is accepted for transportation or placed in a train, the carrier must inspect each rail car containing the hazardous material, at ground level, for required markings, labels, placards, securement of closures, and leakage. These inspections may be performed in conjunction with inspections required under parts 215 and 232 of this title.

Pursuant to the requirements of 49 CFR Part 174-Carriage by Rail Subpart C-General handling and loading requirements section:

§ 174.59 Marking and placarding of rail cars

> No person may transport a rail car carrying hazardous materials unless it is marked and placarded as required by this subchapter. Placards and car certificates lost in transit must be replaced at the next inspection point, and those not required must be removed at the next terminal where the train is classified. For Canadian shipments, required placards lost in transit, must be replaced either by those required by part 172 of this subchapter https://www.ecfr.gov/current/title-49/part-172 or by those authorized under § 171.12.

At several locations and dates during the audit, NS trains were observed with missing placards departing either where a rail car containing a load or residue of a hazardous material was accepted or where that rail car was placed into a train. Specifically, FRA observed 9 instances of non-compliance with § 174.9, and has recommended 4 violations for the non-compliance. FRA also

observed 42 instances of non-compliance with § 174.59 and has recommended one violation for the non-compliance. Based on FRA's findings, NS failed to inspect the rail cars containing a load/residue of a hazardous material at ground level for missing placards and take corrective action for the placard defects prior to accepting or allowing the shipments to continue in transportation. In the event of an emergency, responders rely on the information on a placard as one of the sources of information to determine the proper response to a release of the hazardous material in question. An improper response could exacerbate the hazards associated with the release, possibly putting emergency responders, employees, and potentially the public in additional harm's way.

Recommendation: Ensure that rail cars carrying either a load or residue of hazardous material are inspected and are properly placarded prior to departure from the location where they are accepted or placed into trains.

Finding 2: Locations of hazardous materials shipments are sometimes not accurately documented in train consists.

Pursuant to the requirements of 49 CFR Part 174-Carriage by Rail Subpart B-General operating requirements section:

§ 174.26 Notice to train crews

> The train crew must have a document that reflects the current position in the train of each rail car containing a hazardous material. The train crew must update the document to indicate changes in the placement of a rail car within the train. For example, the train crew may update the document by handwriting on it or by appending or attaching another document to it.
>
> A member of the crew of a train transporting a hazardous material must have a copy of a document for the hazardous material being transported showing the information required by part 172 of this subchapter, including the requirements in § 172.604(b) applicable to emergency response information.

At multiple locations and dates during this audit, FRA found instances where crews did not have or maintain the accurate position of rail cars containing a hazardous material on their train consist or document identifying the placement of these cars in their train. FRA found 39 instances of non-compliance with the requirements of § 174.26 and have recommended 22 violations for the non-compliance. Based on FRA's findings, the inaccurate documentation of the placement in train of the rail cars containing a hazardous material on a train crews consist or document identifying the placement of these cars in their train is the result of two contributing factors:

- Incorrect information in the carrier's train line-up program, or
- The train crew's failure to update their document after either setting-off or picking-up rail cars during their tour of duty.

In the case of a train derailment, it is vital that either the carrier's personnel or emergency responders have an accurate location of railcars containing hazardous materials in the train. Without accurate information, there is an increased likelihood for person(s) walking the train to come in contact with a breached rail car containing a hazardous material.

Recommendation: Ensure that train crews have and maintain documentation to reflect the location of hazardous materials shipments within the train.

Finding 3: Proper segregation of placarded cars, transport vehicles, freight containers, and bulk packages are sometimes not accurately applied within a train.

Pursuant to the requirements of 49 CFR Part 174-Carriage by Rail Subpart D-Handling of placarded rail cars, transport vehicles and freight containers section:

§ 174.85 Position in train of placarded cars, transport vehicles, freight containers, and bulk packagings

(a) Except as provided in paragraphs (b) and (c) of this section, the position in a train of each loaded placarded car, transport vehicle, freight container, and bulk packaging must conform to the provisions of this section.

(b) A car placarded "RADIOACTIVE" must comply with train positioning requirements of paragraph (d) of this section and must be separated from a locomotive, occupied caboose, or carload of undeveloped film by at least one non-placarded car.

(c) A tank car containing the residue of a hazardous material must be separated from a locomotive or occupied caboose by at least one rail car other than a placarded tank car.

FRA identified two instances of non-compliance with § 174.85 and has recommended one violation for the non-compliance. During the audit, FRA found a train with an unauthorized placarded rail car closer than the sixth car to the occupied locomotive during transportation. The carrier or the train crew failed to place the correct number of authorized rail cars between the placement- restricted rail car containing a hazardous material and the locomotive. In the case of a derailment, if the closest rail car containing a placement-restricted hazardous material is nearer than the sixth car from a locomotive, a release of hazardous material could be more likely to subject the train crew members to harm.

Recommendation: Ensure that hazardous materials shipments are properly segregated within a train in accordance with § 174.85, and that crews ensure segregation compliance is maintained within a train when making changes to the consist.

Finding 4: Compliance with required Operating Controls established in DOT-SP-20996.

Pursuant to the requirements of the Pipeline and Hazardous Materials Safety Administration's (PHMSA) Special Permit DOT-SP 20996 all train types and railcar types used with "Unoccupied Distributed Power" section:

7. Safety Control Measures

a. Packaging: All train types and railcar types used with unoccupied distributed power units (UDPs) and dead-in-tow locomotives.

b. Operational Controls:

(1) All locomotives located at the head of the train, or closer than 10 freight cars to an occupied locomotive or occupied rail car, must continue to be subject to the position in train requirements of 49 CFR 174.85.

(2) Dead-in-tow locomotives must continue to be subject to the requirements of 49 CFR 229.9.

(3) The operating rail carrier must keep a copy of the special permit at its operating headquarters.

(4) The operating rail carrier must not deadhead employees on DPUs or dead-in-tow locomotives operating under this special permit.

(5) UDPs and dead-in-tow locomotives must be locked to prevent unintended occupancy during operation.

(6) UDPs and dead-in-tow locomotives are prohibited from placement next to the following rail cars and must be separated by at least one (1) buffer car:

(i) Divisions 1.1 and 1.2.

(ii) Division 2.3 (TIH/PIH) tank cars.

(iii) Division 6.1, Packing Group I, Zone A tank cars

(iv) Class 7 (SNF & HLRW Shipments Only

(7) The operating rail carrier must provide operating employees any necessary changes to their hazmat instructions to ensure compliance with the special permit.

During this audit, FRA also inspected for NS's compliance with the requirements of the operating

controls established in DOT-SP-20996. While no defects were observed during the HM Division's conduct of its field audits, FRA does want to bring to NS's attention a compliance issue that occurred during the period of the FRA's NS audit.

Specifically, a HM train placement issue occurred with Train 19MU126 departing westbound from NS Shaffer's Crossing Yard located in Roanoke, VA, to NS Bluefield Yard in Bluefield, WV. Upon arriving at Shaffer's Crossing Yard, the train crew set out the head thirty-seven rail cars between the lead locomotives and the unoccupied DPU locomotive. When completing this switch, the train crew then went back to the remainder of the train, coupling into the DPU locomotive. Locomotive NS 4107 (the designated DPU) was coupled into residue HM tank car CBTX 785064, a residue shipment of UN 1075//Liquefied Petroleum Gas//Class 2.1, located at position #1 in the outbound train. This is in violation of § 174.85, as section 7(b)(1) states that the Special Permit does not alter requirements for locomotives at the head of the train or closer than 10 freight cars to an occupied locomotive.

In the case of a derailment, if the closest rail car containing a placement-restricted hazardous material is nearer than the sixth car from a locomotive, the risk of injury or fatality to train crew members from a breach of the package containing the hazardous material could potentially be increased.

Recommendation: Ensure trains utilizing SP 20996 adhere to all specified operational conditions established in the SP.

Finding 5: Compliance with required Operating Controls established in DOT-SP-21110.

Pursuant to the requirements of PHMSA's Special Permit DOT-SP 21110 that authorizes the use of electronic means to maintain and communicate on-board train consist information in lieu of paper documentation when hazardous materials are transported by rail section:

7. Safety Control Measures

a. Packaging: As required in the HMR, special permit, or approval.

b. Operational Controls:

(1) This permit is limited to specific routes associated with designated routes as described in this application.

(2) The information describing how to conduct operations under this special permit must be included in the grantee's HM-rules.

(3) The following information must be readily available by electronic means to the train crew during operations; and to Federal, State, or local government representatives (e.g., emergency responders) in the event of an accident/incident or inspection/investigation:

(i) Shipping paper information required pursuant to 49 CFR Part 172, Subparts C and G.

(ii) The current position and identification numbers for all rail cars containing hazardous materials.

(4) Any changes to position of railcars in the train consist must be updated electronically, in real-time, as railcars are added or removed from the train.

(5) As soon as practicable, the grantee must transmit updated car position information to Railinc for use in the AskRail application.

(6) The train crew must be provided mobile device(s) containing the following:

(i) Instructions to the train crew on how to provide the information required by paragraph 7.b.(3) above in electronic format to Federal, State, or local government representatives;

(ii) A copy of this special permit; and

(iii) An electronic document reflecting the current position in the train of each rail car containing a hazardous material.

(7) More than one method of electronic information exchange must be made available to train crews to ensure redundancy and account for potential mobile device limitations of the requesting authority. Upon initial notification of an incident to the agency having jurisdiction ("AHJ") a copy of the train consist must be offered to the AHJ.

(8) One of the selected methods of electronic information exchange must allow for immediate exchange of information to the onsite responders (e.g., transmission between mobile devices).

(9) In the event electronic communication is unavailable, one of the following communication options must be utilized to communicate to first responders.

(i) Conventional land line or facsimile.

(ii) An alternative communication method (e.g., land mobile radio communication, satellite phones) to provide up-to-date electronic shipping paper and train placement information.

(iii) Providing the mobile device directly to first responders for review and inspection on the mobile device.

(1) Training must be provided by the grantee for first responders along areas of the route without cellular service on the methods to be taken in an emergency to access the information on the electronic device when communication with an employee from the railroad is not possible.

(2) Each employee subject to functions covered by this special permit shall be provided training on how to perform these functions by the grantee.

(3) The grantee must provide notification and instruction on the use of this special permit to the emergency response officials along the right-of-way where the permit is being used.

FRA identified one instance of non-conformance with the requirements of SP 21110. An NS train crew was observed using both a paper consist and an electronic device; neither the paper consist nor the electronic device provided an accurate accounting for the location of rail cars transporting hazardous materials. The electronic device did not have an accurate accounting of the placement of the cars containing hazardous material and the train crew did not update their paper consist to reflect the placement of rail cars containing a hazardous material. In the case of a train derailment, it is vital that either the carrier's personnel or emergency responders have an accurate location of railcars containing hazardous materials in the train. There is increased probability that a person(s) walking the train might encounter a breached rail car containing hazardous material.

Recommendation: Ensure that train crews adhere to the requirements to maintain an accurate placement-in-train document per § 174.26 and SP 21110. If a train crew is utilizing both an electronic document and a paper document, both documents must be maintained to reflect accurate position-in-train information of hazardous materials shipments.

Safety Partnerships

FRA's Safety Partnerships Division conducted a limited scope program review to determine compliance with 49 CFR Part 243 - Training, Qualification, and Oversight for Safety-Related Railroad Employees. Part 243 went into effect on January 1, 2020.

Safety Partnerships commenced its program review activities the week of February 7, 2022, at the NS Training Center in McDonough, GA. Observations of additional classes for signal and mechanical personnel are scheduled for the summer and fall of 2022, as a follow-up to the program review; findings of these follow-up reviews will be discussed onsite with NS training staff. Safety Partnerships observed delivery of a new hire conductor class which consisted of lectures, in class practical exercises, and on-the-job-training (OJT) field exercises. Additional training program content analysis continued up until May 27, 2022. These analyses were conducted at FRA mobile offices, as the data requests of NS were received. FRA focused on several areas, including:

- § 243.101(d)(3), requiring the tasks and related steps associated with OJT exercises for a particular category or subcategory of employee to be maintained together in one manual, checklist, or similar document;

- § 243.109(b), requiring NS to review previously approved programs and modify them accordingly when new safety-related Federal railroad laws, regulations, or orders are issued, or new safety-related technologies, procedures, or equipment are introduced into the workplace and result in new knowledge requirements, safety-related tasks, or modification of existing safety-related duties;

- § 243.201(a)(1), requiring NS to designate its existing safety-related railroad employees by occupational category or subcategory, and to limit performance of each category or subcategory to designated employees, by September 1, 2020;

- § 243.203, establishing requirements for content and accessibility of qualification status records;

- § 243.207, requiring NS to complete its first annual review to determine if knowledge or performance gaps exist in the application of Federal railroad safety laws, regulations, and orders by September 1, 2021; and

- § 243.209, requiring NS to maintain a current list of contractors utilized to perform safety related tasks, excluding those contractors whose employees NS may have trained and qualified.

Finding 1: NS failed to provide a copy of the tasks and related steps associated with OJT exercises to its newly hired conductors.

NS failed to provide new hires with a document (digital or hardcopy) containing all OJT tasks and related steps necessary for demonstrating competency and in an occupational category or subcategory, as required by § 243.101(d)(3). NS managers indicated that they simply overlooked this requirement in the regulation. By failing to provide this information, NS did not ensure that new learners have a clear reference of what is necessary to achieve qualification in their craft.

At the time of the audit, NS did not have OJT checklists available for FRA inspection for any occupational category. FRA notes, however, that NS has since remediated this finding for all occupational categories.

Recommendation: Create and provide the required OJT checklists together in one document (digital or hardcopy), for each new employee prior to beginning OJT exercises.

Finding 2: NS failed to conduct its first annual review by September 1, 2021, to determine if knowledge or performance gaps exist in the application of Federal railroad safety laws, regulations, and orders.

NS failed to conduct an annual review of its various safety data and performance metrics to identify knowledge or performance gaps in occupational categories, to determine whether adjustments to a training component of the program are the appropriate intervention to close those gaps, or to otherwise improve the effectiveness of the program, as required by § 243.207. NS managers indicated that they simply overlooked this requirement in the regulation. Failure to

conduct an annual review of the various data performance metrics reduces the number of continuous improvement opportunities with respect to refresher training development and/or modifying existing training curriculum.

Recommendation: Conduct an annual review of safety data and performance metrics within 30 days of this report.

Finding 3: NS incorrectly reported it did not find the need to modify any of its previously approved training programs.

NS did not modify any of its previously approved training programs, as required by § 243.109(b). NS may have overlooked this requirement in the regulation. Failure to conduct an initial annual review as noted in the previous finding was a contributing factor, due to the absence of qualitive and quantitative data analysis necessary to determine if adjustments in training program curricula were appropriate.

Recommendation: Review all active NS courses relating to Federal laws, regulations, or orders and consider revisions based on data gathered from the annual review.

Finding 4: NS partially failed to record the qualification designation(s) of existing and new employees.

NS did not fully describe the qualification designation(s) for existing and new hire employees as required by §§ 243.201 and 243.203. Designating existing employees under § 243.201 is related to § 243.203, in that the latter relates to keeping records by which a railroad indicates the qualification designation(s) of all its employees. At the time of the audit, the NS Learning Management System (LMS) was utilized to maintain the qualification records required by § 243.203 but was not configured to allow officials to record qualification designation. Failure to fully describe all the qualification designation(s) of NS employees impedes FRA's and the employees' ability to understand which safety-related tasks they are qualified to perform.

Recommendation: Complete all ongoing revisions to the LMS to clearly document the qualification designation(s) of all occupational category and subcategory of NS employees.

Motive Power & Equipment (MP&E)

FRA's *Motive Power & Equipment (MP&E) portion of the audit contained several objectives concerning the level of compliance by NS with MP&E Regulations, 49 CFR Parts 215, Freight Car Safety Standards, 218, Railroad Operating Practices (Blue Flag Protection), 229, Railroad Locomotive Safety Standards, 231, Railroad Safety Appliance Standards, and 232, Brake System Safety Standards. The primary objective of the audit was to capture the largest part of the locomotive fleet in service and being operated. The second objective was to observe brake tests, daily inspections, mechanical inspections, blue flag protection of mechanical employees and crews designated to perform inspections on freight cars and locomotives. The last objective was to observe and sample the completeness and record retention of Single Car Airbrake Tests (SCABT) in key locations.*

The MP&E Division conducted an audit of the NS system that consisted of 16 States and 37 individual locations over a span of 10 days, 24 hours a day.

Of the 37 locations inspected, the top 5 locations by defects were:

- Conway, PA 211 defects of which 17 were recommended for violations.
- Enola, PA 204 defects of which 11 were recommended for violations.
- Macon, GA 198 defects of which 3 were recommended for violations.
- Irondale, AL 176 defects of which 7 were recommended for violations.
- Chattanooga, TN 140 defects of which 2 were recommended for violations.

In total FRA inspected 5,035 freight cars, with 810 of those cars defective for a ratio of 16.1%. FRA inspected 420 locomotives, with 291 locomotives defective for a ratio of 69.3%. Of these cars and locomotives, there were a total of 60 recommendations for violation.

FRA commends NS on the locations where significant compliance was demonstrated. For instance, in Kansas City, MO, 1,029 units were inspected with only 36 defects found, and no violations recommended. Also, in Roanoke, VA, 421 units were inspected with only 16 defects

and no violations recommended.

SCABT were sampled and no exceptions were taken.

Finding 1: FRA found instances where NS did not take immediate actions to remediate defective conditions.

Transportation crews on locomotives typically performed the required inspections of their equipment; however, FRA found instances where defective conditions were not reported to the mechanical department for repair, or the equipment was not removed from service until repairs could be made. These conditions could have exposed crews to increased hazards, potential property damage, and injuries due to defective equipment knowingly left in service. Brake tests and mechanical inspection of freight cars resulted in a defect ratio of 16%. In contrast, locomotive inspections resulted in a 69.3% defect ratio.

Consistent reporting of defective conditions to the mechanical department by the transportation department is a concern

Recommendation: Ensure effective and timely communication between the transportation department and the mechanical department of defective conditions identified by members of the transportation department.

Signal & Train Control

The first objective of the Signal & Train Control (S&TC) portion of the audit was to determine the level of NS compliance with 49 CFR Parts 228, 234, and 236. The second objective was to follow up on NS remedial actions in response to the FRA S&TC Division's NS Dispatch review in 2021. A final objective was to review records and reports to validate:

a. *Positive Train Control (PTC) System Performance to include Reporting (Enforcements, Initialization Failures, Cut-Outs and Malfunctions).*

b. *Configuration Management (New or Updated control plans, Critical Features Verification and Validation (V&V) Process).*

c. *Validation of current Positive Train Control Implementation Plan (PTCIP) and Positive Train Control Safety Plan (PTCSP) documentation.*

d. *PTC Training by disciplines.*

The FRA S&TC Division conducted an audit of the NS system between April 12 and April 22, 2022. This audit consisted of inspections in 12 States and 21 different Districts (the NS term for Subdivision) over a span of 10 days.

FRA found no instances of noncompliance for PTC system performance. The carrier has an effective procedure in place to ensure system performance, reporting, and identify and address potential failures.

During these two weeks, the S&TC Division inspected 640 units and 4,661 sub-units, finding 286 defects of which 42 were recommended as violations. FRA identified several additional defects and violations during this audit not related to the above objectives. The majority of defects and violations discovered during this audit related to issues addressed during the 2021 Signal Dispatch Review. These issues include Hours of Service (HOS) recordkeeping and interference of Maintenance of Way (MoW)/train crews (OP) at HRGCs.

NS is working to correct the HOS recordkeeping program to identify missing information, which comprise many of the FRA defects. This is a continuation of the action plan NS

provided to FRA last year. FRA will continue to monitor this for progress. NS is reaching out to other Class I railroads to see how they have improved their MoW and OP interference issues. This is also a continuation of the remedial action plan NS provided to FRA last year. This issue has improved but remains a concern. FRA will continue to monitor this for progress.

Because those findings were addressed in an earlier report, FRA is not making any related recommendations in this report. The S&TC Division has continued discussions with NS senior management regarding the NS action plan to correct the systemic issues noted above.

Finding 1: FRA found instances where NS did not update certain circuit plans in a timely fashion.

At 30 percent of the locations whose records were inspected by FRA, significant changes were made at one or more Highway Rail Grade Crossings (HRGCs), but the circuit plans had not been updated to show these changes. As a result of the failure to timely update these circuit plans pursuant to 49 CFR § 234.201, employees do not have accurate information, which could increase the likelihood that they could put in place changes that degrade the safe operation of the crossing warning system.

Recommendation: Develop and implement a process for ensuring that changes to warning systems at HRGCs are recorded in applicable circuit plans in a timely fashion.

Track

The objectives of the Track portion of the audit were to determine NS compliance with 49 CFR Parts 213 and 214.

During the two weeks of inspections conducted, FRA's Track Division inspected 13,923 units, documented 4,145 defects, and recommended 30 violations. The majority of FRA's findings are centered on three primary issues, including the NS Continuous Welded Rail (CWR) plan, track special work defects, and increased defect ratios when walking inspections are conducted.

Finding 1: NS CWR activities were not compliant with regulatory requirements.

As part of the Track Division's NS audit, the Rail Integrity Team evaluated the effectiveness of NS rail defect and CWR plan monitoring. This included a review of CWR records in 19 randomly selected NS districts, with randomly selected locations for field follow-up to verify if the records matched the activities in the field.

There are two parts to the CWR findings identified by FRA during this audit. The first part is associated with field identification inspections by the Track Inspectors and Rail Integrity Specialists looking for compliance with the written CWR plan and procedures. In this part, FRA inspected 228 assets and found 134 non-compliant conditions with 125 defects of which 9 of those were recommended for violation. Most non-compliance centered on:

- Rail anchoring or fastening requirements that were not in accordance with the NS CWR plan under defect code 213.119.B;
- Non-compliant rail joint installation and maintenance procedures under defect codes 213.119.C2 and C3; and
- Identified failures to follow procedures to maintain the desired rail installation temperature range during rail plug cut-ins under defect code 213.119.D.

The second component of FRA's CWR findings focuses on compliance with record-keeping and documentation that were field verified through follow-up verification inspections for rail plug cut-

ins. Overall review of CWR activities revealed 532 rail record defects that were identified out of 1,947 rail records sampled by FRA. A review of CWR reporting activities looked at 19 districts/subdivisions and identified 1,805 defects over multiple affiliated documents. The Rail Integrity Team's field verifications uncovered unreliable reporting data, which could demonstrate a lack of CWR follow-up monitoring and potentially inaccurate documentation of work performed. The Team reviewed 13,680 rail/added or removed records (line-items), finding that 2,361 of those records contained an entry stating that zero inches of track were added or removed at a temperature that is outside the 20-degree safe temperature range specified in the NS CWR plan. These records did not show the adjusted rail neutral temperature (RNT) after that work was performed, as required by 49 CFR § 213.119(j)(1). These records indicate that NS is tracking rail that is added and removed without sufficient procedures to control for adjusted rail neutral temperature, which is not in compliance with the requirements of 213.119.D.

There are two additional issues found involving NS CWR plan monitoring. The Rail Integrity Team found a flaw in how NS is recording remedial action taken for FRA classified rail defects. FRA reviewed 2,310 total records (line items) of rail defects identified for repair. Of these, FRA noted that 1,606 were FRA classified rail defects. FRA remedial action codes have a multi-level remediation process with FRA requiring the initial remedial action to be recorded. In 676 of those records, or 42% of the time, the initial reported remedial action code was incorrectly applied.

The second is that NS has provided field personnel with a "Reference Mark Field Guide." This guide is not included in their submitted CWR plan, and FRA has not approved this field guide under § 213.118. In the field guide procedures, the workforce is required to make their reference marks and then write the distance "after the work" has been completed. This is not an approved process for CWR match marks as it is not included in the approved NS CWR Plan. FRA discovered the workforce was not correctly applying the reference marks.

The NS CWR plan does not have sufficient written procedures for calculating the RNT. Instead, the NS CWR plan simply attempts to track the amount of rail that is added or removed from the track. This is not consistent with § 213.119(d) & (f). FRA findings of inconsistent CWR plan application along with omitted procedural documentation, and inaccurate reporting of initial remedial actions, are serious concerns that further compounds the issue of tracking rail

added/removed. A CWR plan is intended to be a complete, stand-alone document that consists of an FRA-approved set of procedures to be used by the engineering work groups (that can be verified by FRA Inspectors) for the proper management of thermal forces induced by the RNT. Making changes to the CWR plan without re-submission to FRA for review is not in compliance with § 213.118 and can lead to improper application of track buckling/pull apart countermeasures, inconsistent rail cut-ins, and improper reporting of corrective actions taken to repair or protect both buckle prone and pull-apart prone conditions.

Summary

There appears to be an inconsistent application of CWR procedures among the NS engineering workforce. For example, in multiple instances NS CWR records did not match the rail marking information in the field.

1. NS is only tracking rail added or removed, and the CWR plan does not provide directions for calculating the RNT after work is performed to assure the RNT has been adjusted to the proper safe range.

2. Initial remedial actions for rail defects are in general not being clearly reported in NS rail records. NS use of letters for codes corresponding to the letters in the 213.113 Remedial Action Table can be unclear and could have multiple meanings for the work performed leading to a number of different actions taken under that one code. Some NS workers reported letter codes which represent actions that are more restrictive than those required in the table but are not the required action for defects of that nature. Because of this imprecise coding system, the workforce did not select the correct code 42% of the time.

According to NS, the CWR policy submitted in January 2021 is consistent with the regulation as written and addresses issues cited during the FRA System Audit. They assert that acceptance of NS's plan as submitted would resolve the exceptions cited in this report. FRA disagrees and will discuss the matter further with NS during the upcoming plan review process.

Recommendations:

Resubmit a revised CWR plan for FRA approval that:

- **Includes proper reporting requirements for rail plug cut-ins that establishes control and proper monitoring by NS management for the proper adjustment of RNT in accordance with §§ 213.118 & 119.**

- **Includes written procedures which address: the installation, adjustment, maintenance, and inspection of CWR; inspection of CWR joints; and an updated training program for the application of those procedures.**

- **Retrain § 213.7(c) personnel who are qualified to inspect CWR or supervise the installation, adjustment, and maintenance of CWR track in the proper FRA reporting requirements for initial remedial action for rail record retention.**

- **Clearly define initial remedial actions associated with field activities taken to replace, repair, or protect defective rails listed in accordance with the table of § 213.113(c).**

Finding 2: The NS program for maintaining Main Track and Yard Track Switches (turnouts) could be improved.

For the most part, main line track on the NS system is well maintained. However, FRA took exceptions for loose, worn, and missing fastening components in turnouts. FRA inspection of turnouts looks at the overall component effectiveness, including general fasteners, switch and rail components, and the crossing or turnout frogs as a system for the safe transition from one track to another track. All components of the turnout play a vital role in this critical area of the track structure for safe train movement. Of the 2,821 turnouts on main track, 1,204 defects were identified with 9 of those defects being recommended for violation, resulting in a defect ratio of 43%. Of the 2,665 turnouts in yard track, 1,582 defects were identified with none of those defects recommended for violation at this time, but did result in a defect ratio of 59%.

For main track and yard track turnouts the table below shows the most common identified turnout defects.

Part	Code	Description	Defect count	Rec. Violation
213	119.B	Failure to comply with written CWR procedures	95	9
213	133.A12	Loose, worn or missing frog bolts	401	
213	133.A13	Loose, worn or missing guard rail bolts	163	
213	133.A14	Loose, worn or missing guard rail clamps/wedges or other components	102	
213	133.A15	Other turnout or crossing fastenings not intact or maintained	152	
213	135.D	Heel of switch insecure	350	
213	137.A	Insufficient flangeway depth	32	
213	137.C	Tread portion of frog worn in excess of allowable	46	
213	137.F	Severe frog condition not otherwise provided	133	
213	141.A	Raised guard worn excessively	11	
213	143.A1	Guard check gage less than allowable	83	5

FRA conducted a random sample of FRA inspection reports of NS trackage to provide additional insight into which component defects were identified with the greatest frequency.

Highest Frequency Component Defects

Main Defects	Counts	Yard Defect	Counts
119.B	17	133.A12	41
133.A9	11	135.D	35
133.A12	9		
133.A15	30		
135.D	5		
137.F	4		

The above tables highlight that 213.119.B (*Failure to comply with written CWR procedures – anchoring or fastening*) defects should be addressed along with critical turnout components that were found loose and not maintained. This is particularly true of loose, worn, and missing frog bolts and insecure heel blocks. Turnout component defects identified on the main track during the audit yielded a defect ratio above the national average of 24%.

Turnouts play a critical function that turnouts in the safety of the track structure. When critical components are not maintained, there is an increased risk of sudden failure with catastrophic potential. Data obtained from FRA's Safety Data Site shows derailments that, between January 2017 and March of 2022, NS had 83 derailments associated with turnouts. This totaled $8,136,313 in report damages. Of these, 16 derailments occurred on the mainline, totaling $5,118,395 in damages.

Summary

- Main track turnout components accounted for 29% of all defects.

- Yard track turnout components accounted for 38% of all defects.
- Improved identification and maintenance of Frog bolts, insecure heel blocks, loose fasteners, overall frog conditions, and adjacent guard rails is necessary.

Recommendations:

Develop and implement an approach to address defects in turnout areas that:

- **Improves oversight of track inspection reporting in critical component areas of turnouts.**
- **Improves support for follow-up maintenance activities once component issues are identified with a focus on quality repairs.**
- **Addresses severely deficient frog conditions**.

Finding 3: The NS track inspection program could be improved with increased walking inspections.

In both the main tracks and yard tracks there is an increase in identified track conditions related to special work defects when walking inspections were conducted. This is especially true for joint bars, where 85 defects were identified under defect code 213.121.E (*Less than 2 bolts per rail at any joint in continuous welded rail*) and 95 defects were identified under defect code 213.121.F (*Loose joint bars (joint rail)*). These accounted for 180 defective joint bar conditions, and there was a total of 307 defects (7%) in the category of joint bar defects identified during the audit. If joint bars are not maintained, they can fail suddenly; derailments associated with failed joint bars are usually associated with high reported damage costs.

This is supported by data obtained from FRA's Safety Data Site that shows derailments between January 2017 and March of 2022. For all types of derailments associated with joint bars, NS had a total 8 derailments that totaled $2,305,726 in damages. Of these, 4 were main line derailments totaling $2,115,123 in damages.

Summary

- Walking inspections are more effective at finding certain types of defects.

In its comments, NS noted that they comply with the regulatory walking inspection requirements. In this instance, FRA is noting that NS has an opportunity to increase the effectiveness of their track inspection program.

Recommendations:

- **Increase periodic walking inspection in main tracks at joints at ends of curves and CWR rail cut-ins.**
- **Increase periodic walking inspection in yards for improved joint bar defect identification.**

Conclusion

FRA provided NS with a draft copy of this report in July 2022. NS reviewed the report and provided comments. Where NS provided factual corrections or requested clarifying edits to the text, FRA has revised its report. Other comments are summarized in the relevant sections, and FRA has included brief responses.

FRA's audit illustrated that in many aspects, NS programs are largely effective and compliant with relevant safety regulations. Still, NS has many opportunities to improve employee and manager awareness of and compliance with both FRA safety regulations and NS safety programs. With more effective use of training, improved management oversight, or even innovative applications of technology, NS can better prevent property damage, loss of life, or catastrophic damage to communities by ensuring its personnel have all of the knowledge and tools they need to maximize railroad safety.