

DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration

Safety Advisory 2015-04

**Ballast Defects and Conditions—Importance of Identification and Repair in
Preventing Development of Unsafe Combinations of Track Conditions**

AGENCY: Federal Railroad Administration (FRA) Department of Transportation (DOT).

ACTION: Notice of Safety Advisory.

SUMMARY: FRA is issuing this safety advisory to emphasize the importance of timely repairing ballast defects and conditions on main tracks. FRA notes that ballast defects and ballast conditions that are not repaired in a timely manner can lead to future defects. FRA believes it is important for track inspectors to be aware that ballast defects and conditions can cause track components to deteriorate rapidly and compromise the stability of the track structure, and that inspectors are trained to identify and repair ballast defects and conditions. This safety advisory recommends that track owners and railroads: (1) assess current engineering instructions on ballast safety and update them to provide specific guidance to track inspectors (designated personnel that are qualified to inspect and repair track) on how to identify and initiate remedial action under 49 CFR 213.233(d) for ballast defects and conditions, as well as on the appropriate remedial action to implement, particularly in areas with one or more additional track conditions;

(2) train track inspectors on the updated engineering instructions and this safety advisory to ensure they understand how to identify and initiate remedial action for ballast defects and conditions in a timely manner, and understand the importance of such remedial action in preventing the development of unsafe combinations of track conditions; and (3) ensure that supervisors provide adequate oversight of track inspectors to achieve identification and remediation of ballast defects and other track conditions.

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SUPPLEMENTARY INFORMATION:

Background—Ballast may consist of crushed stone, crushed slag, screened gravel, and other materials; ballast is an integral part of the track structure. Ballast, regardless of the material, must satisfy all four of the requirements in FRA’s track safety standards in 49 CFR part 213. See §§ 213.103 and 213.334.¹

The sole appearance of fouled ballast (i.e., ballast contaminated with broken-down particles, mud, coal dust, or other foreign material) may not warrant immediate corrective action if the ballast is properly transmitting and distributing the load, restraining the track, providing adequate drainage, and maintaining proper geometry. However, when ballast cannot adequately drain free-standing water, wheel loads are likely to be concentrated, rather than distributed. The concentrated wheel loads can cause

¹ All references to sections or part in this safety advisory are to a section or part of Title 49 of the CFR.

rapid deterioration of track components and track instability, which can increase the risk of derailment. In addition, as noted below in the discussion regarding an accident that occurred at a fouled ballast location, track instability can not only result from an individual track defect, but from a combination of track conditions. FRA reminds track owners and railroads of their responsibility under § 213.7 to ensure all persons they designate as qualified to either supervise certain renewals of track or inspect track for defects know and understand the requirements of part 213, are able to detect deviations, and can prescribe appropriate remedial action.

Ballast defects are often readily apparent through indications of poor geometry and structure degradation. FRA believes that a location with a combination of a ballast defect with a marginal geometry condition² warrants additional monitoring, more restrictive remedial action, or both, to correct or safely compensate for the combined defect and condition.

Railroad track inspectors should exercise their technical knowledge and professional experience to identify and record ballast defect or condition locations, and should take into account the severity of any geometry conditions along with the following factors to determine appropriate remedial action:

- Operating practice: train speed, loading environment, route type and density, proximity to population centers;
- Track structure: rail, crossties, and fastener deterioration (mechanical wear from impact force), condition causing excessive rail cant (particularly abraded concrete crossties), concentrated support under ties, and localized excessive loading of ties;

² A geometry condition means a track surface, gage, or alinement irregularity that does not exceed the allowable threshold for the designated track class in the track safety standards.

- Roadbed and right-of-way condition: sufficiently maintained to allow free-draining shoulder and crib ballast, unrestricted cross and lateral drainage;
- Special trackwork and transition points:³ turnouts, bridges, rail crossings, and highway/rail crossings.

Ballast defects are not associated with a track classification under §§ 213.9 and 213.307 requirements. Normally, ballast degradation is a gradual process. However, environmental conditions can accelerate the degradation rate and pose a safety threat to train operations. The safe passage of trains is reliant on the track inspector to recognize and assess the safety risk through training and experience.

Ballast conditions that produce a derailment risk must be corrected by repair or by applying appropriate restrictions upon discovery. The railroad's designated track inspector is responsible for conducting a proper inspection and applying appropriate remedial action.

Highlighted Accident—On July 18, 2013, at approximately 8:29 p.m., northbound CSX Transportation Train Q70419 derailed at Milepost 9.99 while traversing the No. 2 Main Track on the Metro-North Commuter Railroad Company's Hudson Line. FRA and the National Transportation Safety Board (NTSB) investigated the accident.

The accident was caused by the rail canting outward under increased dynamic wheel-rail loads due to the combination of gage and profile deviations and center-bound concrete crossties resulting in damage sufficient to reduce their ability to hold gage.

These conditions developed from the ballast failing to properly support the track

³Transition points occur at locations where there is an abrupt change in the vertical stiffness (support) of the track, such as the approach to a bridge. Transition points increase the dynamic loading of the track, causing more rapid deterioration of track components (e.g., ballast, crossties, rail fasteners, and rail).

structure, which itself was the result of inadequate drainage. A track inspector performing proficient track inspections should have recognized the degrading ballast and geometry conditions, and the likelihood for center-bound crossties, and taken responsible corrective action. To prevent the development of such unsafe combinations of track conditions, FRA believes it is important that track owners and railroads assess current internal engineering instructions and update them to provide specific guidance to track inspectors on how to identify ballast defects and other track conditions. It is also important that track owners and railroads provide clear guidance on how to determine and apply appropriate remedial action, particularly in locations where the combination of track geometry and structure conditions produces an increased risk of derailment.

FRA further believes that alerting track owners or railroads to the issue of unsafe combinations of track conditions and highlighting a derailment resulting from a combination of marginal track conditions at a fouled ballast location provides a sufficient basis for these entities to review engineering standards and to consider requiring additional attention and action in areas with multiple track conditions. This is particularly true when geometry and structural deviations are produced by poorly-performing ballast.

The NTSB's safety recommendations resulting from its investigation of the derailment discussed above are on its Web site at www.nts.gov. The NTSB recommended that FRA define specific allowable limits for combinations of track conditions, none of which individually amount to a deviation from FRA regulations that require remedial action.

Recommended Action—In light of the above discussion, and in addition to complying with the requirements of part 213, including §§ 213.7 and 213.103, FRA recommends that track owners and railroads take the following actions:

1. Assess current internal engineering instructions in view of the concerns raised in this Safety Advisory 2015-04, and update them to ensure that the instructions provide specific guidance to track inspectors on how to identify and initiate remedial action under § 213.233(d) for ballast defects and other ballast conditions, and on the appropriate remedial action to implement, particularly in areas with one or more additional track conditions.
2. Train track inspectors on the updated engineering instructions and this safety advisory. Such training should ensure that each track inspector understands the following:
 - a. Identification of Ballast Defects and Conditions. Know the requirements and purpose of track subgrade and ballast and understand the circumstances that can lead to ballast failure and other ballast defects and conditions, such as inadequate drainage, saturated subgrade, and transition points (e.g., highway-rail grade crossings and approaches to bridges).
 - b. Remedial Action for Ballast Defects and Conditions. Understand the importance of maintaining ballast and initiating remedial action for any ballast defects or conditions in preventing the development of one or more additional track conditions (e.g., gage widening, alinement and track surface deviations) or track structure conditions (e.g., center-bound

crossties, loose or missing fasteners, rail cant, etc.), especially around transition points or other areas susceptible to ballast degradation.

3. Ensure that supervisors provide oversight of track inspectors to achieve proper identification and remediation of ballast defects and other track conditions.

FRA encourages the railroad industry to take appropriate action consistent with the preceding recommendations and any other actions to ensure the safety of the Nation's railroad employees, passengers, and the general public. FRA may modify this Safety Advisory 2015-04, issue additional safety advisories, or take other appropriate actions it deems necessary to ensure the highest level of safety, including pursuing other corrective measures under its rail safety authority.

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Chief Safety Officer.