Memorandum

U.S. Department of Transportation

Federal Railroad Administration

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Subject: Technical Bulletin T-2019-01
Safety Guidance on 49 CFR § 213.103 (Ballast; general)

From: Karly Alexy KA
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To: All Regional Administrators

Attached is Track Safety Standards Technical Bulletin T-2019-01. The bulletin clarifies the application of Title 49 Code of Federal Regulations (CFR) § 213.103 (Ballast; general). All affected personnel are to utilize this bulletin as guidance when enforcing 49 CFR § 213.103.

Please distribute to all regional personnel and State program partners within your regions. It will also be posted on the Federal Railroad Administration's Website.

If there are any questions concerning this Technical Bulletin, please contact Dr. Yu-Jiang Zhang, Staff Director, Track Division, at 202-493-6460, or yujiang.zhang@dot.gov.

Attachment

Federal Railroad Administration
Track Safety Technical Bulletin T-19-01
Title 49 Code of Federal Regulations Part 213

Over the past several years, the Federal Railroad Administration (FRA) received several inquiries concerning the application and interpretation of *Title 49 Code of Federal Regulations (CFR) Section 213.103 (§ 213.103) (Ballast; general).* The FRA Track and Rail and Infrastructure Integrity Compliance Manual (compliance manual), dated March 2018, provides guidance on the application of this section (*See* Volume II, Chapter I Track Safety Standards Classes 1-5, pages 2.1.53—54). The Office of Technical Oversight is issuing this technical bulletin to replace the guidance pertaining to 49 CFR § 213.103 currently contained in the compliance manual.

Section 213.103 reads as follows:

§ 213.103 Ballast; general

Unless it is otherwise structurally supported, all track shall be supported by material which will—

(a) Transmit and distribute the load of the track and railroad rolling equipment to the subgrade;

(b) Restrain the track laterally, longitudinally, and vertically under dynamic loads imposed by railroad rolling equipment and thermal stresses imposed by the rails;

(c) Provide adequate drainage for the track; and

(d) Maintain proper track crosslevel, surface, and alinement.

Guidance: Ballast may consist of crushed slag, crushed stone, screened gravel, pit-run gravel, chat, cinders, scoria, pumice, sand, mine waste, or other natural material, and is an integral part of the track structure. Ballast, regardless of the material, must satisfy all four of the requirements stated in paragraphs (a)-(d) of 49 CFR § 213.103.

The mere appearance of fouled ballast (e.g., ballast contaminated with broken down ballast particles, mud, coal dust, or any foreign particles) does not warrant a defect or violation to be written if the performance standards of paragraphs (a)–(d) are being met (i.e., if the ballast section is properly transmitting the load, restraining the track, providing adequate drainage, and maintaining proper geometry).

Inspectors should consider the overall condition of a track when citing a ballast defect or recommending a violation of 49 CFR § 213.103 (including fouled ballast or other failure modes that render the ballast unable to perform any one of its four functions). In doing so, inspectors should look for indicators that the ballast is not performing each of its four functions, such as the existence of a crosstie and/or geometry condition or inadequate drainage. For example, fouled ballast that does not provide adequate drainage, as required by paragraph (c) of 49 CFR § 213.103, is of particular concern because it compromises the ability of ballast to perform its other three functions (i.e., to distribute load, restrain track, and maintain proper geometry). When fouled ballast with inadequate drainage is present, wheel loads are likely to be

concentrated, rather than distributed, causing deterioration of components and instability in the area of the defective ballast. This deterioration of components and instability increases the risk of track shift (e.g., a track buckle) and also increases the rate of degradation of geometry. Thus, a ballast violation may be warranted if the track has inadequate drainage and there is a geometry condition or a series of fouled ballast locations with geometry conditions. Other factors that affect the rate of degradation or components and geometry include the tonnage, traffic density, and operating speeds, because higher tonnage, traffic density and operating speeds increase the amount and/or frequency of the forces exerted on the components.

Inspectors should also take into account the safety and risk issues associated with a ballast condition when considering enforcement action. Typically, lower speeds are associated with lower risk, and when considering whether to issue defects or recommend violations for track with speeds of 10 mph or less, such as FRA Class 1 yard track or other than main track, the inspector should consider the totality of the circumstances, including the risk of derailment and the potential for catastrophic consequences. On Class 1 or other track where the maximum authorized speed does not exceed 10 mph, any enforcement action should be taken in consultation with the inspector's regional specialist.

The term "geometry condition" used here means a track surface, gage, or alinement irregularity that does not exceed the allowable threshold for the designated track class in Subpart C of the Track Safety Standards. Instead, the condition reflects a reduced or non-existent capability of one or more components of the track structure to hold the track to its preferred geometric position. Traditionally, FRA does not associate non-class specific defects (including ballast defects) with class-specific geometry thresholds. However, it is well recognized that ballast conditions will, to some degree, be manifested in track geometry.

It is impossible to specify the amount of a geometry condition at which track safety is impaired in all instances, considering there are virtually an infinite number of scenarios. In some cases, a 30 percent geometry variance may pose significant safety concerns, and in many other cases a 60 percent geometry variance may pose no safety concerns. Therefore, the inspector's expert discretion is crucial in determining appropriate enforcement action in specific situations.

Nevertheless, to enhance the uniformity of FRA's application of 49 CFR § 213.103, a 50 percent variance has been established as a margin of safety, representing a reference threshold to support enforcement action under 49 CFR § 213.103(d) (see Table 1). As a general matter, unless other safety risks are present or other compounding factors exist, inspectors should issue ballast defects or recommend violations only when geometry conditions exceed the relevant variances noted below.

Table 1: Reference Geometry Thresholds for Ballast Defects and Violations

Track Geometry Parameters (inches) for operations at a qualified cant deficiency ≤ 5"	Class of Track				
	1*	2	3	4	5
62-ft profile (deviation from uniform profile on either rail at the mid-ordinate of a 62-ft chord may not be more than)	1 ½	1 ⅜	1 ⅛	1	⅝
Deviation from zero crosslevel at any point on tangent or reverse crosslevel elevation on curves may not be more than	1 ½	1	⅞	⅝	½
Difference in crosslevel between any two points less than 62 ft apart may not be more than	1 ½	1 ⅛	1	⅞	¾
31-ft alinement deviation of the uniformity of the mid-cord offset may not be more than	N/A	N/A	⅝ (C[1])	½ (C[1])	¼ (C[1])
62-ft alinement deviation of the uniformity of the mid-cord offset for may not be more than	2 ½	1 ½	⅞	¾	5/16 (C[1]) ⅜ (T[2])
The gage must not be more than	57 ¾	57 ½	57 ½	57 ¼	57 ¼

[1] C = Curved track (curvature > 0.25 degree)
[2] T = Tangent track (curvature ≤ 0.25 degree)
* In general, inspectors should only cite ballast defects on Class 1 track, siding, industry lead, or connector tracks if substantial risk is present, e.g., adjacent to main track, HazMat/Passenger/Strategic Rail Corridor Network (STRACNET) routes.

These values are based on preliminary engineering analysis, field testing, and past practice. Note that these thresholds should only be used as general guidance. Accordingly, inspectors maintain the discretion to issue ballast defects and/or recommend violations, regardless of the presence or extent of geometry conditions, if warranted by other safety factors, including, but not limited to:

- Track class and operating speed;
- Traffic density and wheel loads;
- Adequacy of shoulder ballast and crib ballast;
- Track type: passenger, hazardous materials, or STRACNET routes;
- Potential that the track may deteriorate very rapidly following heavy rains;
- Center-bound crossties, if observable;
- Rail and fastener conditions;
- Subgrade condition;
- Surrounding track structure (e.g., embankment or cut, obvious/observable variation of track stiffness of the left from right side of the track, and from the adjacent areas along the track);
- Proximity of the defective ballast locations to switches, joints, or bridges; and
- Existence of standing water or indications that water had been standing (as water sometimes gets trapped beneath the ties and may not be visible on the surface). Note: If the standing water appears to be due to obstructed drainage facilities, enforcement action may be more appropriate under 49 CFR § 213.33.