# Memorandum

We make lives better through connections.

**To:** Jyotsna Vishwakarma PE, Chief Engineer

**From:** Kirk Strand PE, Engineering Services Manager

**Date:** May 10, 2023

**Re:** **CAP02-1122022 Evaluate Industry Track Standards**

This memo is written to address a commitment within Corrective Action Plan CAP02-1122022 to *"evaluate industry track standards, including Federal Railroad Administration (FRA) standards, to determine whether a more robust classification exists to document wear."*

**Summary of Review**

The current RTD MOW Track Safety Standards 2021 is a direct adaptation of the *APTA-RT-FS-S-002-02 Rail Transit Track Inspection and Maintenance* Standard, Revision 1, published in 2017. There is a *Review of Standards for Track Inspection and Maintenance (FTA Report No. 0215)* published in 2022. Industry practices were reviewed in a 2013 Transit Cooperative Research Program (*TCRP*) report, *Review of Rail Transit Track Inspection Practices*. This document has an Appendix E, that summarizes the comparison between APTA, FRA, and several other transit systems. **RTD's MOW Track safety standards are in line with other like agencies. A more formal prioritization method for repairs might be worth considering in the future for RTD's maintenance of track.**

**Background**

As shown in Appendix E, there are no significant differences in the limiting values between FRA, APTA, RTD or others. The Classification of Track is also standardized across the industry. All agencies in the cited reports use the same track classification system that adds a speed penalty as the track condition deteriorates. Some agencies separate the safety standard from the maintenance standard. RTD does not have a separate Track Maintenance Standard. As stated in the 2013 Report "some transit agencies have multiple maintenance limits referring to the urgency of repair (red, yellow, green, for example) that allow the transit agencies to prioritize maintenance.

**Review**

1. "Evaluate industry track standards including FRA standards," --Response: See Appendix E Track Standards the values are not significantly different.
2. "To determine whether a more robust classification method exists." --Response: No, track classes are standardized and based on reducing speed as track conditions worsen. There are not different methods.
3. "Document wear" --Response: The term "wear" in the railroad industry is usually in reference to rail wear. My assumption for this document is that "wear" as stated in the CAP, is being used as a euphemism for overall trackway condition. Otherwise, actual rail wear limits are addressed in the American Railway Engineering and Maintenance-of-Way Association (AREMA) manuals and generally accepted across the industry.

As stated above, there are two government publications that directly address the CAP topic. I have extracted some of the more pertinent info for your use.
The report referenced below is an evaluation of track standards and does include FRA.

1. FTA published Report No. 0215 (May 2022): Research Report and Findings: Review of Standards for Track Inspection and Maintenance. "This research was performed to determine the state of inspection and maintenance practices for rail transit agencies in the U.S. Project objectives included (1) performing an extensive literature review to summarize and compare current specifications and standards for rail transit track inspection and maintenance in the U. S. and other countries, including what is being used by agencies in the U.S., (2) performing a gap analysis to determine deficiencies in current standards, and (3) establishing recommendations to FTA for developing voluntary standards, protocols, guidelines, or recommended practices associated with rail transit track inspection and maintenance. A series of findings are presented."

   "There were two types of limits in the reviewed documents, and it is important to recognize the differences between them. Safety standards, also referred to as safety limits or intervention limits, are limits that, if surpassed, are considered safety and derailment risks by the controlling regulatory agency. Maintenance standards, also referred to as maintenance limits or alert limits, are typically stricter than safety limits. Transit agencies often use maintenance limits internally to ensure that no safety limits are ever exceeded, and regulatory or non-regulatory government agencies often use these as guidelines or recommendations for the transit agencies to follow. **Also, some transit agencies have multiple maintenance limits referring to the urgency of repair (red, yellow, green, for example) that allow the transit agencies to prioritize maintenance."**

AND

2. TCRP Synthesis 107 Rail Transit Inspection Practices: A Synthesis for Transit Practices (2013)

   This synthesis summarizes state-of-the-practice information on track inspection and maintenance standards and recommended safety practices, in an effort to assist all transit agencies in the development of their own set of track safety standards and, more importantly, maintenance standards. Since many transit agencies are not part of the national railroad system, and therefore not governed by federal inspection or maintenance practices, each agency must establish its own maintenance program to ensure that passengers are transported in a safe and reliable manner.

   "..minimum safety standards that are used, fewer than half (13) of the 29 agencies reported using FRA, a similar number **(14) use APTA**, two (2) agencies use California Public Utilities Commission, one (1) uses the FTA, and five reported having their own minimum safety standards. These standards are similar, and the table shows the similarities between APTA and the FRA. When asked if they had maintenance standards, 24 (83%) said they have their own, four (14%) agencies do not have maintenance standards, and five (17%) said that their maintenance standards are the same as the track safety standards. Twenty-one agencies, or about three-quarters(72%), have a priority system requiring speed restrictions if a defect is found, whereas the rest (28%) do not.

Appendix E: Compares the FRA, APTA and other systems.

# APPENDIX E

## APTA/FRA Track Safety Standards and Some Maintenance Standards

The following charts are based on reported maintenance standards. Each transit agency has its own maintenance standards and many use either APTA or the FRA for their safety standards. Maintenance standards and safety standards are not the same. The first column is the item number used as a reference number only. The second column is a brief description of the criteria used for maintenance. (See Appendix F for further explanation.)

The third column is the class of track. Each track class has an assigned maximum speed that trains may travel before the risk of a derailment is too great. The fourth column is the speeds assigned to the classes of track. Both APTA and FRA agree with respect to maximum passenger speed. The remainder of the columns represents minimum and maximum values of each individual transit authority.

| Item | Description of Defect | Class of Track | Max passenger speed in mph APTA and FRA | APTA | | FRA | | Agency Maintenance Criteria | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | A | | B | | C | | D | | E | | F | | G | | I | | J | |
| | | | | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In |
| 1 | Variation from standard gage | 1 | 15 | -½ | 1½ | -½ | 1½ | -⅛ | ¾ | -¼ | ¾ | -½ | 1 | -⅜ | 1 | -½ | 1¼ | -½ | 1 | -⅛ | 1¼ | -½ | 1½ | -½ | 1 |
| | | 2 | 30 | | 1¼ | | 1¼ | | | | | | ⅞ | | | | | | | | | | | | |
| | | 3 | 60 | | | | | | | | | | ⅝ | | ⅝ | -7/16 | 1 | -⅜ | ¾ | | | | 1¼ | -⅜ | ¾ |
| | | 4 | 80 | | 1 | | 1 | | | | ½ | | | | | -⅜ | ¾ | -¼ | ½ | -⅛ | 1 | -½ | | | |
| | | 5 | 90 | | | | | | | | | | ¼ | | | | | | | | | | 1 | -¼ | ½ |
| 2 | Variation in alignment - 62' chord - Tangent | 1 | 15 | | 5 | | 5 | | 1 | No Criteria | | | 1 | | 2 | | 3 | | 5 | No Criteria | | | 5 | | 2¼ |
| | | 2 | 30 | | 3 | | 3 | | ¾ | | | | ½ | | 1½ | | 2 | | 3 | | | | 3 | | 1½ |
| | | 3 | 60 | | 1¾ | | 1¾ | | | | | | ¾ | | 1¼ | | 1½ | | | | | | 1¾ | | |
| | | 4 | 80 | | 1½ | | 1½ | | ½ | | | | | | 1 | | | | | | | | 1½ | | |
| | | 5 | 90 | | ¾ | | ¾ | | | | | | 0 | | ¾ | | 1¼ | | 1½ | | | | ¾ | | 1 |
| 3 | Variation in alignment - 31', ( ) = 62' chord - Curve | 1 | 15 | | 3 | N/A | | | ⅝ | | 1¼ | | 1 | | (2) | | 2¼ | | (4) | 1½ | 1½ | N/A | | | 1¼ |
| | | 2 | 30 | | | N/A | | | | | | | ½ | | (1½) | | 1½ | | (2½) | | | N/A | | | 1¼ |
| | | 3 | 60 | | 1¼ | | 1¼ | | | | ½ | | ¾ | | (1¼) | | 1 | | | ¾ | ¾ | | 1¼ | | |
| | | 4 | 80 | | 1 | | 1 | | ¼ | | | | | | (¾) | | ¾ | | (1¼) | | | | 1 | | ⅝ |
| | | 5 | 90 | | ½ | | ½ | | | | ¼ | | 0 | | (½) | | | | | | | | ½ | | |
| 4 | High Water ( ) = Height above base of Rail | 1 | 15 | | Head | No Criteria | | No Criteria | | | Head | | 6½ | No Criteria | | | Head | No Criteria | | | Head | No Criteria | | No Criteria | |
| | | 2 | 30 | | Web | | | | | | Web | | 5 | | | | Web | | | | Web | | | | |
| | | 3 | 60 | | | | | | | | | | 1¼ | | | | | | | | | | | | |
| | | 4 | 80 | | Base | | | | | | Base | | 0 | | | | Base | | | | Base | | | | |
| | | 5 | 90 | | | | | | | | | | 0 | | | | | | | | | | | | |
| 5 | Runoff in 31' | 1 | 15 | | 3½ | | 3½ | | 1½ | | 3½ | No Criteria | | | 1½ | | 1½ | | 3 | | 3 | | 3½" | | 2½ |
| | | 2 | 30 | | 3 | | 3 | | 1 | | 2 | | | | 1 | | | | 2½ | | 2 | | 3 | | 1½ |
| | | 3 | 60 | | 2 | | 2 | | ½ | | | | | | 1 | | | | | | | | 2 | | |
| | | 4 | 80 | | 1½ | | 1½ | | | | 1 | | | | ¾ | | | | 1½ | | | | 1½ | | 1¼ |
| | | 5 | 90 | | 1 | | 1 | | | | | | | | ½ | | | | | | | | 1 | | |
| 6 | Surface Deviation 62' Chord | 1 | 15 | | 3 | | 3 | | 1½ | No Criteria | | No Criteria | | | 2 | | 3 | | 2¾ | | 2¾ | | 3 | | 2½ |
| | | 2 | 30 | | 2¾ | | 2¾ | | 1 | | | | | | 1½ | | 2¾ | | 2¼ | | | | 2¾ | | 2 |
| | | 3 | 60 | | 2¼ | | 2¼ | | | | | | | | 1 | | 2¼ | | | | 2¼ | | 2¼ | | |
| | | 4 | 80 | | 2 | | 2 | | ¾ | | | | | | ¾ | | 2 | | 1¾ | | | | 2 | | 1⅜ |
| | | 5 | 90 | | 1¼ | | 1¼ | | | | | | | | ⅜ | | | | | | | | 1¼ | | |
| 7 | Surface Deviation 31' Chord | 1 | 15 | | 1 | No Criteria | | No Criteria | | | ¾ | | 2 | No Criteria | | | 1 | No Criteria | | | 1¼ | No Criteria | | No Criteria | |
| | | 2 | 30 | | ¾ | | | | | | 9/16 | | 1¼ | | | | ¾ | | | | | | | | |
| | | 3 | 60 | | ½ | | | | | | | | ⅞ | | | | ½ | | | | 1¼ | | | | |
| | | 4 | 80 | | ⅜ | | | | | | ¼ | | ½ | | | | ⅜ | | | | | | | | |
| | | 5 | 90 | | ¼ | | | | | | | | | | | | | | | | | | | | |

| Item | Description of Defect | Class of Track | Max passenger speed in mph APTA and FRA | APTA | | FRA | | Agency Maintenance Criteria | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | A | | B | | C | | D | | E | | F | | G | | I | | J | |
| | | | | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In |
| 8 | Deviation from 0 cross-level in 62' | 1 | 15 | | 3 | | 3 | | 1 | | 3 | | 1½ | | 2 | | 3 | | 2½ | | 2 | | 3 | | 1⅞ |
| | | 2 | 30 | | 2 | | 2 | | ¾ | | 1¾ | | ¾ | | 1¾ | | 2 | | 1¾ | | 1¾ | | 2 | | 1¼ |
| | | 3 | 60 | | 1¾ | | 1¾ | | ½ | | | | ½ | | 1¼ | | 1¾ | | | | | | 1¾ | | |
| | | 4 | 80 | | 1¼ | | 1¼ | | | | 1 | | 1 | | 1 | | 1¼ | | 1¼ | | | | 1¼ | | 1⅛ |
| | | 5 | 90 | | 1 | | 1 | | | | | | ¼ | | ¾ | | | | | | | | 1 | | |
| 9 | Deviation from theoretical cross-level in 62', ( ) = 31' chord in spirals | 1 | 15 | | 2 | No Criteria | | No Criteria | | No Criteria | | | 1¼ | No Criteria | | | 2 | | (1¾) | | 1½ | No Criteria | | | (1½) |
| | | 2 | 30 | | 1¾ | | | | | | | | ⅞ | | | | 1¾ | | (1½) | | | | | | (1⅛) |
| | | 3 | 60 | | 1½ | | | | | | | | ½ | | | | 1½ | | | | 1¼ | | | | |
| | | 4 | 80 | | 1 | | | | | | | | | | | | | | (1) | | | | | | (⅞) |
| | | 5 | 90 | | ¾ | | | | | | | | ¼ | | | | 1 | | | | | | | | |
| 10 | Warp/Twist in 62' | 1 | 15 | | 3 | | 3 | | 1¼ | No Criteria | | No Criteria | | | 2 | | 3 | | 2½ | | 2 | | 3 | | 2⅛ |
| | | 2 | 30 | | 2¼ | | 2¼ | | 1 | | | | | | 1¾ | | 2¼ | | 1¾ | | | | 2¼ | | 1¾ |
| | | 3 | 60 | | 2 | | 2 | | ⅝ | | | | | | 1¼ | | 2 | | | | 1¾ | | 2 | | |
| | | 4 | 80 | | 1¾ | | 1¾ | | | | | | | | 1 | | 1¾ | | 1¼ | | | | 1¾ | | 1⅝ |
| | | 5 | 90 | | 1½ | | 1½ | | | | | | | | ¾ | | | | | | | | 1½ | | |
| 11 | Warp/Twist in 31' | 1 | 15 | | 2 | | 2 | No Criteria | | No Criteria | | No Criteria | | No Criteria | | | 2 | No Criteria | | | 2 | | 2 | No Criteria | |
| | | 2 | 30 | | 1¾ | | 1¾ | | | | | | | | | | 1¾ | | | | 1¾ | | 1¾ | | |
| | | 3 | 60 | | 1½ | | 1¼ | | | | | | | | | | 1½ | | | | 1½ | | 1¼ | | |
| | | 4 | 80 | | 1¼ | | 1 | | | | | | | | | | 1¼ | | | | 1¼ | | 1 | | |
| | | 5 | 90 | | 1 | | ¾ | | | | | | | | | | | | | | 1 | | ¾ | | |
| 12 | Non-Defective Ties or fasteners in 39', ( ) = 62', [ ] = out of 10, { } = 100' | 1 | 15 | 6 | | 5 | | 14 | | 6 | | (16) | | [4] | | 14 | | 5 | | 6 | | 5 | | 5 | |
| | | 2 | 30 | 8 | | 8 | | | | 8 | | (18) | | [6] | | 11 | | 8 | | 8 | | 8 | | 8 | |
| | | 3 | 60 | | | | | 16 | | | | (20) | | | | | | | | | | | | | |
| | | 4 | 80 | 12 | | 12 | | | | 15 | | (22) | | [7] | | 7 | | 9 | | 12 | | 12 | | 8 | |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Non-Defective Ties in 39', ( ) = 62'for greater than 2° curves | 1 | 15 | No Criteria | | 6 | | 14 | | 6 | | (16) | | No Criteria | | 13 | | 6 | | No Criteria | | 6 | | 6 | |
| | | 2 | 30 | | | 9 | | | | 9 | | (18) | | | | 10 | | 9 | | | | 9 | | 9 | |
| | | 3 | 60 | | | 10 | | 16 | | | | (20) | | | | 9 | | | | | | 10 | | | |
| | | 4 | 80 | | | 14 | | | | 21 | | (22) | | | | 5 | | 11 | | | | 14 | | 10 | |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Maximum defective ties or fasteners in a row for > 2000'R, ( ) = distance in inches | 1 | 15 | | 5 | No Criteria | | | 3 | | 3 | | 5 | | 4 | | 5 | | 4 | | 5 | No Criteria | | | 4 |
| | | 2 | 30 | | | | | | | | | | 4 | | | | | | 3 | | | | | | 3 |
| | | 3 | 60 | | 4 | | | | 2 | | 2 | | 3 | | 3 | | 4 | | | | 4 | | | | |
| | | 4 | 80 | | 3 | | | | | | | | 2 | | | | 3 | | 2 | | 3 | | | | 2 |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |

| Item | Description of Defect | Class of Track | Max passenger speed in mph APTA and FRA | APTA | | FRA | | Agency Maintenance Criteria | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | A | | B | | C | | D | | E | | F | | G | | I | | J | |
| | | | | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In |
| 15 | Maximum defective ties or fasteners in a row for Radius between 1000' and 2000'. ( ) = distance in inches | 1 | 15 | | 4 | No Criteria | | | 3 | | 2 | | 4 | | 3 | | 4 | No Criteria | | | 4 | No Criteria | | No Criteria | |
| | | 2 | 30 | | | | | | | | | | 3 | | | | | | | | | | | | |
| | | 3 | 60 | | 3 | | | | | | 1 | | 3 | | 2 | | 3 | | | | 3 | | | | |
| | | 4 | 80 | | 2 | | | | 2 | | | | 2 | | | | 2 | | | | 2 | | | | |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 16 | Maximum defective ties or fasteners in a row for R < 1000'. ( ) = distance in inches | 1 | 15 | | 3 | No Criteria | | | 3 | | 2 | | 4 | | 2 | | 3 | | 3 | | 3 | No Criteria | | | 3 |
| | | 2 | 30 | | | | | | | | | | 3 | | | | | | 2 | | | | | | 2 |
| | | 3 | 60 | | 2 | | | | | | 1 | | 3 | | 1 | | 2 | | | | 2 | | | | 2 |
| | | 4 | 80 | | 1 | | | | 2 | | | | 2 | | | | 1 | | 1 | | 1 | | | | 1 |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 17 | Quarter Cracked joint bars with bolts loose | 1 | 15 | N/A | | N/A | | Replace in 30 days | | Replace | | Replace | | No Criteria | | N/A | | N/A | | N/A | | N/A | | N/A | |
| | | 2 | 30 | | | | | | | | | | | | | | | | | | | | | | |
| | | 3 | 60 | Replace | | Replace | | | | | | | | | | Replace | | Replace | | Replace | | Replace | | Replace | |
| | | 4 | 80 | | | | | | | | | | | | | | | | | | | | | | |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 18 | Center cracked joint bars | | | Replace | | Replace | | Replace Immediate | | Replace Immediate | | Replace Immediate | | No Criteria | | Replace | | Replace | | Replace | | Replace | | Replace | |
| 19 | Less than 2 bolts per rail, Classes 2-5 and 1 bolt per rail for Class 1 | | | Install | | Install | | Install | | Install | | Install | | Install | | Install | | Install | | Install | | Install | | Install | |
| 20 | In CWR at least 2 bolts per rail | | | Install | | Install | | Install | | Install | | Install | | Install | | Install | | Install | | Install | | Install | | Install | |
| 21 | Torch cut holes or torch cut rail | 1 | 15 | N/A | | N/A | | No Criteria | | Not Permitted | | Not Permitted | | Not Permitted | | N/A | | N/A | | N/A | | N/A | | N/A | |
| | | 2 | 30 | | | | | | | | | | | | | | | | | | | | | | |
| | | 3 | 60 | Replace Rail | | Replace Rail | | | | | | | | | | Replace Rail | | Replace Rail | | Replace Rail | | Replace Rail | | Replace Rail | |
| | | 4 | 80 | | | | | | | | | | | | | | | | | | | | | | |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 22 | Number of ties within 24" of the center of a joint | 1 | 15 | 1 | | 1 | | 1 within 12" | | 1 within 24" | | No Criteria | | No Criteria | | 1 | | 1 | | 1 | | 1 | | 1 | |
| | | 2 | 30 | | | | | | | | | | | | | | | | | | | | | | |
| | | 3 | 60 | 2 | | 2 | | | | 1 within 18" | | | | | | 2 | | 2 | | 2 | | 2 | | 2 | |
| | | 4 | 80 | | | | | | | | | | | | | | | | | | | | | | |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |

| Item | Description of Defect | Class of Track | Max passenger speed in mph APTA and FRA | APTA | | FRA | | Agency Maintenance Criteria | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | A | | B | | C | | D | | E | | F | | G | | I | | J | |
| | | | | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In |
| 23 | Reconfigure joint bars with a torch. | 1 | 15 | OK | | OK | | No Criteria | | Not Permitted | | Not Permitted | | Not Permitted | | OK | | OK | | OK | | OK | | OK | |
| | | 2 | 30 | | | | | | | | | | | | | | | | | | | | | | |
| | | 3 | 60 | No | | No | | | | | | | | | | No | | No | | No | | No | | No | |
| | | 4 | 80 | | | | | | | | | | | | | | | | | | | | | | |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 24 | Tread Mis-Match | 1 | 15 | | ¼ | | ¼ | | ¼ | | ¼ | No Criteria | | | 3/16 | | ¼ | | ⅜ | | ¼ | | ¼ | | ⅜ |
| | | 2 | 30 | | | | | | 3/16 | | 3/16 | | | | ⅛ | | | | ¼ | | | | | | ¼ |
| | | 3 | 60 | | 3/16 | | 3/16 | | | | | | | | | | 3/16 | | | | 3/16 | | 3/16 | | |
| | | 4 | 80 | | ⅛ | | ⅛ | | ⅛ | | ⅛ | | | | 1/16 | | ⅛ | | ⅛ | | ⅛ | | ⅛ | | ⅛ |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 25 | Gage Face Mis-Match | 1 | 15 | | ¼ | | ¼ | | 3/16 | | ¼ | No Criteria | | | ⅛ | | ¼ | | ¼ | | ¼ | | ¼ | | ¼ |
| | | 2 | 30 | | 3/16 | | 3/16 | | | | 3/16 | | | | | | 3/16 | | 3/16 | | 3/16 | | 3/16 | | 3/16 |
| | | 3 | 60 | | | | | | | | | | | | | | | | | | | | | | |
| | | 4 | 80 | | ⅛ | | ⅛ | | ⅛ | | ⅛ | | | | 1/16 | | ⅛ | | ⅛ | | ⅛ | | ⅛ | | ⅛ |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 26 | Rail end batter | 1 | 15 | | ½ | | ½ | | 3/16 | | ½ | No Criteria | | | ¼ | | ½ | | ⅜ | | ½ | | ½ | | ⅜ |
| | | 2 | 30 | | ¼ | | ¼ | | | | ¼ | | | | | | ¼ | | ¼ | | ¼ | | ¼ | | ¼ |
| | | 3 | 60 | | 3/16 | | 3/16 | | ⅛ | | | | | | 3/16 | | 3/16 | | | | 3/16 | | 3/16 | | |
| | | 4 | 80 | | ⅛ | | ⅛ | | | | ⅛ | | | | ⅛ | | ⅛ | | ⅛ | | ⅛ | | ⅛ | | ⅛ |
| | | 5 | 90 | | 1/16 | | 1/16 | | | | | | | | 1/16 | | | | | | 1/16 | | 1/16 | | |
| 27 | Restraining Rail Flangeway ( ) = from design | 1 | 15 | 1½ | | 1½ | | No Criteria | | 1½ | 3 | No Criteria | | 1½ | | No Criteria | | (-⅜) | (⅜) | 1½ | | 1½ | | | 2⅛ |
| | | 2 | 30 | | | | | | | | | | | | | | | (-¼) | (¼) | | | | | | |
| | | 3 | 60 | | | | | | | 1¾ | 2¾ | | | | | | | | | | | | | | 1⅞ |
| | | 4 | 80 | | | | | | | | | | | | | | | | | | | | | | |
| | | 5 | 90 | | | | | | | | | | | | | | | (-⅛) | (⅛) | | | | | | 1¾ |
| 28 | Double guard face gage with restraining rail on both running rails. | 1 | 15 | | +½ | No Criteria | | No Criteria | | | | No Criteria | | No Criteria | | No Criteria | | No Criteria | | | +½ | No Criteria | | | 2 |
| | | 2 | 30 | | | | | | | | | | | | | | | | | | | | | | |
| | | 3 | 60 | | +⅜ | | | | | | ⅜ | | | | | | | | | | +7/16 | | | | 1¾ |
| | | 4 | 80 | | | | | | | | | | | | | | | | | | | | | | |
| | | 5 | 90 | | +¼ | | | | | | | | | | | | | | | | +¼ | | | | 1⅞ |
| 29 | Frog Flangeways | 1 | 15 | 1½ | | 1½ | | 1¾ | 2 | No Criteria | | No Criteria | | 1½ | | 1½ | | 1½ | | 1½ | | 1½ | | 1¼ | |
| | | 2 | 30 | | | | | | | | | | | | | | | | | | | | | | |
| | | 3 | 60 | | | | | | | | | | | | | | | | | | | | | | |
| | | 4 | 80 | | | | | | | | | | | | | | | | | | | | | | |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |

| Item | Description of Defect | Class of Track | Max passenger speed in mph APTA and FRA | APTA | | FRA | | Agency Maintenance Criteria | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | A | | B | | C | | D | | E | | F | | G | | I | | J | |
| | | | | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In |
| 30 | Minimum flangeway depth in a frog | 1 | 15 | 1⅜ | | 1⅜ | | 1½ | | 1⅜ | | No Criteria | | 1½ | | 1⅜ | | 1½ | | 1⅜ | | 1⅜ | | No Criteria Flange Bearing | |
| | | 2 | 30 | 1½ | | 1½ | | | | 1½ | | | | | | 1½ | | | | 1½ | | 1½ | | | |
| | | 3 | 60 | | | | | | | | | | | | | | | | | | | | | | |
| | | 4 | 80 | | | | | | | | | | | | | | | | | | | | | | |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 31 | Tread Wear on Frog | 1 | 15 | | | | | No Criteria | | No Criteria | | | ⅝ | | | | | | | | | | | | |
| | | 2 | 30 | | | | | | | | | | ½ | | | | | | | | | | | | |
| | | 3 | 60 | | ⅜ | | ⅜ | | | | | | ⅜ | | ⅜ | | ⅜ | | ⅜ | | ⅜ | | ⅜ | | ⅜ |
| | | 4 | 80 | | | | | | | | | | ¼ | | | | | | | | | | | | |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 32 | Guard Check Gage | 1 | 15 | -½ | | -½ | | -⅛ | ⅜ | -¼ | | -½ | | -⅞ | | -⅜ | | -½ | | -⅛ | | -½ | | -½ | |
| | | 2 | 30 | -⅜ | | -⅜ | | | | | | -⅜ | | -¼ | | -¼ | | -⅜ | | | | -⅜ | | -⅜ | |
| | | 3 | 60 | -¼ | | -¼ | | | | | | -¼ | | | | | | | | | | -¼ | | | |
| | | 4 | 80 | | | | | | | | | -¼ | | -⅛ | | -⅛ | | -⅛ | | | | | | -⅛ | |
| | | 5 | 90 | -⅛ | | -⅛ | | | | | | -⅛ | | | | | | | | | | -⅛ | | | |
| 33 | Guard Face Gage | 1 | 15 | | ½ | | ½ | -⅛ | ¼ | | ¼ | | ½ | | ½ | | ½ | | ½ | | ⅛ | | ½ | No Criteria | |
| | | 2 | 30 | | | | | | | | | | | | | | ⅜ | | ⅜ | | | | | | |
| | | 3 | 60 | | ⅜ | | ⅜ | | | | | | ⅜ | | ¼ | | ¼ | | | | | | ⅜ | | |
| | | 4 | 80 | | | | | | | | | | | | | | | | ¼ | | | | | | |
| | | 5 | 90 | | ¼ | | ¼ | | | | | | ¼ | | | | | | | | | | ¼ | | |
| 34 | Frequency of Hi-Rail or walking inspection on Mainline/Siding Track | Excepted | | Weekly | | Monthly | | Weekly | | Twice Weekly | | Monthly | | Monthly | | Twice Weekly | | Twice Weekly | | Twice per Month | | Weekly | | Twice Weekly | |
| | | 1 | 15 | | | Weekly | | | | | | | | | | | | | | | | | | | |
| | | 2 | 30 | | | | | | | | | | | | | | | | | | | | | | |
| | | 3 | 60 | | | | | | | | | | | | | | | | | | | | | | |
| | | 4 | 80 | | | Twice Weekly | | | | | | | | | | | | | | | | | | | |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 35 | Frequency of Gage Restraint (GRMS) Testing on Mainline | >2MGT,>30mph Pass. | | No Criteria | | Annually | | No | | No | | No | | No | | No | | No | | No | | No | | No | |
| | | <2MGT,<30mph Pass. | | | | 24 months | | | | | | | | | | | | | | | | | | | |
| 36 | Frequency of Geometry Car Testing on Mainline | | | Once per year | | No Criteria | | 3 times per Year | | 3 times per year | | Every 2 years | | Twice per year | | Twice per year | | 4 times per year | | Once per Year | | Once per Year | | Once per Year | |

| Item | Description of Defect | Class of Track | Max passenger speed in mph APTA and FRA | APTA | | FRA | | Agency Maintenance Criteria | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | A | | B | | C | | D | | E | | F | | G | | I | | J | |
| | | | | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In | Min In | Max In |
| 37 | Frequency of Rail Flaw Detection Testing on Mainline | 1 | 15 | Once per year | | Once/30mgt Once/year, whichever longest | | Twice per Year | | 6 times per year | | Once per Year | | Twice per year | | Twice per year | | Twice per year | | Once per Year | | Once per Year | | Once per Year | |
| | | 2 | 30 | | | | | | | | | | | | | | | | | | | | | | |
| | | 3 | 60 | | | Once/40mgt Once/year, whichever shortest | | | | | | | | | | | | | | | | | | | |
| | | 4 | 80 | | | | | | | | | | | | | | | | | | | | | | |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 38 | Rail Wear Limits (Gage - Top) | 1 | 15 | No Criteria | | No Criteria | | ⅝ | ⅝ | 7/16 | ½ | ⅞ | 1 | ⅝ | ½ | 5/8 | 5/16 | ⅞ | ⅝ | No Criteria | | No Criteria | | ⅞ | ½ |
| | | 2 | 30 | | | | | | | | | ⅝ | ⅞ | | | ½ | ¼ | ¾ | ½ | | | | | | |
| | | 3 | 60 | | | | | | | | | ½ | ⅝ | | | | | | | | | | | | |
| | | 4 | 80 | | | | | | | | | ⅜ | ½ | | | 7/16 | 1/16 | ½ | ⅜ | | | | | | |
| | | 5 | 90 | | | | | | | | | | | | | | | | | | | | | | |
| 39 | CWR Plan (Yes or No) | | | Yes | | Yes | | Yes | | Yes | | No | | Yes | | Yes | | Yes | | No | | Yes | | No | |
| 40 | 3rd Rail Inspection | | | No Criteria | | No Criteria | | 1/Year | | | | | | | | | | | | | | | | | |
| | Max 3rd Rail Wear | | | | | | | ⅝ | | ¾ | | | | | | | | | | | | | | | |
| | 3rd Rail Gage | | | | | | | | | | | | | | | | | -½ | ½ | | | | | | |
| | Max Speed in mph | | | | | | | >60 | | 55 | | 60 | | >60 | | >60 | | 45 | | 45 | | >60 | | 50 | |

Min In = Minimum requirement in inches

Max In = Maximum requirement in inches

If description requirement states unit in hole number then applies

APTA is the American Public Transportation Association, FRA is the Federal Railroad Administration

Agency maintenance criteria is listed as Agency A, B, C etc to maintain aninimity

Classes of track and related speeds may vary slightly among Transit Agencies. Speeds are shown as APTA and FRA limits.

See Appendix F for definitions of criteria

9 Transit Agencies are shown which represents those agencies that willingly submitted their Maintenance Criteria.