DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration

49 CFR Parts 213 and 238

[Docket No. FRA–2009–0036, Notice No. 1]

RIN 2130–AC09

Vehicle/Track Interaction Safety Standards; High-Speed and High Cant Deficiency Operations

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

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: FRA is proposing to amend the Track Safety Standards and Passenger Equipment Safety Standards applicable to high-speed and high cant deficiency train operations in order to promote the safe interaction of rail vehicles with the track over which they operate. The proposal would revise existing limits for vehicle response to track perturbations and add new limits as well. The proposal accounts for a range of vehicle types that are currently used and may likely be used on future high-speed or high cant deficiency rail operations, or both. The proposal is based on the results of simulation studies designed to identify track geometry irregularities associated with unsafe wheel/rail forces and accelerations, thorough reviews of vehicle qualification and revenue service test data, and consideration of international practices.

DATES: Written comments must be received by July 9, 2010. Comments received after that date will be considered to the extent possible without incurring additional expense or delay.

FRA anticipates being able to resolve this rulemaking without a public, oral hearing. However, if FRA receives a specific request for a public, oral hearing prior to June 9, 2010, one will be scheduled and FRA will publish a supplemental notice in the **Federal Register** to inform interested parties of the date, time, and location of any such hearing.

ADDRESSES: *Comments:* Comments related to Docket No. FRA–2009–0036, Notice No. 1, may be submitted by any of the following methods:

- *Federal eRulemaking Portal:* Go to *http://www.regulations.gov.* Follow the online instructions for submitting comments.
- *Mail:* Docket Management Facility, U.S. Department of Transportation, 1200 New Jersey Avenue, SE., West Building Ground Floor, Room W12–140, Washington, DC 20590.
- *Hand Delivery:* Docket Management Facility, U.S. Department of Transportation, 1200 New Jersey Avenue, SE., West Building Ground Floor, Room W12–140, Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- *Fax:* 202–493–2251.

Instructions: Note that all comments received will be posted without change to *http://www.regulations.gov,* including any personal information provided. Please *see* the Privacy Act discussion, below.

Docket: For access to the docket to read background documents or comments received, go to *http://www.regulations.gov* anytime, or to the Docket Management Facility, U.S. Department of Transportation, 1200 New Jersey Avenue, SE., West Building Ground Floor, Room W12–140, Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. Follow the online instructions for accessing the dockets.

FOR FURTHER INFORMATION CONTACT: John J. Mardente, Engineer, Office of Railroad Safety, Mail Stop 25, Federal Railroad Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590 (telephone 202–493–1335); Ali Tajaddini, Program Manager for Vehicle/Track Interaction, Office of Railroad Policy and Development, Mail Stop 20, Federal Railroad Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590 (telephone 202–493–6438); or Daniel L. Alpert, Trial Attorney, Office of Chief Counsel, Mail Stop 10, Federal Railroad Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590 (telephone 202–493–6026).

SUPPLEMENTARY INFORMATION:

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I. Statutory Background

A. Track Safety Standards

The first Federal Track Safety Standards were published on October 20, 1971, following the enactment of the Federal Railroad Safety Act of 1970, Public Law 91–458, 84 Stat. 971 (October 16, 1970), in which Congress granted to FRA comprehensive authority over "all areas of railroad safety." *See* 36 FR 20336. FRA envisioned the new Standards to be an evolving set of safety requirements subject to continuous revision allowing the regulations to keep pace with industry innovations and agency research and development. The most comprehensive revision of the Standards resulted from the Rail Safety Enforcement and Review Act of 1992, Public Law 102–365, 106 Stat. 972 (Sept. 3, 1992), later amended by the Federal Railroad Safety Authorization Act of 1994, Public Law 103–440, 108 Stat. 4615 (November 2, 1994). The amended statute is codified at 49 U.S.C. 20142 and required the Secretary of Transportation (Secretary) to revise the Track Safety Standards, which are contained in 49 CFR part 213. The Secretary delegated the statutory rulemaking responsibilities to the Administrator of the Federal Railroad Administration. *See* 49 CFR 1.49.

B. Passenger Equipment Safety Standards

In September 1994, the Secretary convened a meeting of representatives from all sectors of the rail industry with the goal of enhancing rail safety. As one of the initiatives arising from this Rail Safety Summit, the Secretary announced that DOT would develop safety standards for rail passenger equipment over a 5-year period. In November 1994, Congress adopted the Secretary's schedule for implementing rail passenger equipment safety regulations and included it in the Federal Railroad Safety Authorization Act of 1994. Congress also authorized the Secretary to consult with various organizations involved in passenger train operations for purposes of prescribing and amending these regulations, as well as issuing orders pursuant to them. Section 215 of this Act is codified at 49 U.S.C. 20133.

II. Proceedings to Date

A. Proceedings To Carry Out the 1992/1994 Track Safety Standards Rulemaking Mandates

To help fulfill the statutory mandates, FRA decided that the proceeding to revise part 213 should advance under the Railroad Safety Advisory Committee (RSAC), which was established on March 11, 1996. (A fuller discussion of RSAC is provided below.) In turn, RSAC formed a Track Working Group, comprised of approximately 30 representatives from railroads, rail labor, trade associations, State government, track equipment manufacturers, and FRA, to develop and draft a proposed rule for revising part 213. The Track Working Group identified issues for discussion from several sources, in addition to the statutory mandates issued by Congress in 1992 and in 1994. Ultimately, the Track Working Group recommended a proposed rule to the full RSAC body, which in turn formally recommended to the Administrator of FRA that FRA issue the proposed rule as it was drafted.

On July 3, 1997, FRA published an NPRM which included substantially the same rule text and preamble developed by the Track Working Group. The NPRM generated comment, and following consideration of the comments received, FRA published a final rule in the **Federal Register** on June 22, 1998, *see* 63 FR 33992, which, effective September 21, 1998, revised the Track Safety Standards in their entirety.

To address the modern railroad operating environment, the final rule included standards specifically applicable to high-speed train operations in a new subpart G. Prior to the 1998 final rule, the Track Safety Standards had addressed six classes of track that permitted passenger and freight trains to travel up to 110 m.p.h.; passenger trains had been allowed to operate at speeds over 110 m.p.h. under conditional waiver granted by FRA. FRA revised the requirements for Class 6 track, included them in new subpart G, and also added three new classes of track in subpart G, track Classes 7 through 9, designating standards for track over which trains may travel at speeds up to 200 m.p.h. The new subpart G was intended to function as a set of "stand alone" regulations governing any track identified as belonging to one of these high-speed track classes.

B. Proceedings To Carry Out the 1994 Passenger Equipment Safety Standards Rulemaking Mandate

FRA formed the Passenger Equipment Safety Standards Working Group to provide FRA with advice in developing the regulations mandated by Congress. On June 17, 1996, FRA published an advance notice of proposed rulemaking (ANPRM) concerning the establishment of comprehensive safety standards for railroad passenger equipment. *See* 61 FR 30672. The ANPRM provided background information on the need for such standards, offered preliminary ideas on approaching passenger safety issues, and presented questions on various passenger safety topics. Following consideration of comments received on the ANPRM and advice from FRA's Passenger Equipment Safety Standards Working Group, FRA published an NPRM on September 23, 1997, to establish comprehensive safety standards for railroad passenger equipment. *See* 62 FR 49728. In addition to requesting written comment on the NPRM, FRA also solicited oral comment at a public hearing held on November 21, 1997. FRA considered the comments received on the NPRM and prepared a final rule, which was published on May 12, 1999. *See* 64 FR 25540.

After publication of the final rule, interested parties filed petitions seeking FRA's reconsideration of certain requirements contained in the rule. These petitions generally related to the following subject areas: structural design; fire safety; training; inspection, testing, and maintenance; and movement of defective equipment. On July 3, 2000, FRA issued a response to the petitions for reconsideration relating to the inspection, testing, and maintenance of passenger equipment, the movement of defective passenger equipment, and other miscellaneous provisions related to mechanical issues contained in the final rule. *See* 65 FR 41284. On April 23, 2002, FRA responded to all remaining issues raised in the petitions for reconsideration, with the exception of those relating to fire safety. *See* 67 FR 19970. Finally, on June 25, 2002, FRA completed its response to the petitions for reconsideration by publishing a response to those petitions concerning the fire safety portion of the rule. *See* 67 FR 42892. (For more detailed information on the petitions for reconsideration and FRA's response to them, please *see* these three rulemaking documents.) The product of this rulemaking was codified primarily at 49 CFR part 238 and secondarily at 49 CFR parts 216, 223, 229, 231, and 232.

C. Identification of Key Issues for Future Rulemaking

While FRA had completed these rulemakings, FRA and interested industry members began identifying various issues for possible future rulemaking. Some of these issues resulted from the gathering of operational experience in applying the new safety standards to Amtrak's high-speed, Acela Express (Acela) trainsets, as well as to higher-speed commuter railroad operations. These included concerns raised by railroads and rail equipment manufacturers as to the application of the new safety standards and the consistency between the requirements contained in part 213 and those in part 238. Other issues arose from the conduct of research, allowing FRA to gather new information with which to evaluate the safety of high-speed and high cant deficiency rail operations. FRA decided to address these issues with the assistance of RSAC.

FRA notes that train operation at cant deficiency involves traveling through a curve faster than the balance speed. Balance speed for any given curve is the speed at which the lateral component of centrifugal force will be exactly compensated (or balanced) by the corresponding component of the gravitational force. When operating above the balance speed, there is a net lateral force to the outside of the curve. Cant deficiency is measured in inches and is the amount of superelevation that would need to be added to the existing track in order to balance this centrifugal force with this gravitational force to realize no net lateral force measured in the plane of the rails. For every curve, there is a balance speed at which the cant deficiency is zero based on the actual superelevation built into the track. In general terms, the higher the train speed through a curve, the higher the cant deficiency.

D. RSAC Overview

As mentioned above, in March 1996, FRA established RSAC, which provides a forum for developing consensus recommendations to FRA's Administrator on rulemakings and other safety program issues. The Committee includes representation from all of the agency's major stakeholders, including railroads, labor organizations, suppliers and manufacturers, and other interested parties. A list of member groups follows:

- American Association of Private Railroad Car Owners (AAPRCO);

- American Association of State Highway and Transportation Officials (AASHTO);
- American Chemistry Council;
- American Petroleum Institute;
- American Public Transportation Association (APTA);
- American Short Line and Regional Railroad Association;
- American Train Dispatchers Association;
- Association of American Railroads (AAR);
- Association of Railway Museums;
- Association of State Rail Safety Managers (ASRSM);
- Brotherhood of Locomotive Engineers and Trainmen (BLET);
- Brotherhood of Maintenance of Way Employees Division (BMWED);
- Brotherhood of Railroad Signalmen (BRS);
- Chlorine Institute;
- Federal Transit Administration (FTA);*
- Fertilizer Institute;
- High Speed Ground Transportation Association (HSGTA);
- Institute of Makers of Explosives;
- International Association of Machinists and Aerospace Workers;
- International Brotherhood of Electrical Workers (IBEW);
- Labor Council for Latin American Advancement;*
- League of Railway Industry Women;*
- National Association of Railroad Passengers (NARP);
- National Association of Railway Business Women;*
- National Conference of Firemen & Oilers;
- National Railroad Construction and Maintenance Association;
- National Railroad Passenger Corporation (Amtrak);
- National Transportation Safety Board (NTSB);*
- Railway Supply Institute (RSI);
- Safe Travel America (STA);
- Secretaria de Comunicaciones y Transporte;*
- Sheet Metal Workers International Association (SMWIA);
- Tourist Railway Association, Inc.;
- Transport Canada;*
- Transport Workers Union of America (TWU);
- Transportation Communications International Union/BRC (TCIU/BRC);
- Transportation Security Administration;* and
- United Transportation Union (UTU).

*Indicates associate, non-voting membership.

When appropriate, FRA assigns a task to RSAC, and after consideration and debate, RSAC may accept or reject the task. If the task is accepted, RSAC establishes a working group that possesses the appropriate expertise and representation of interests to develop recommendations to FRA for action on the task. These recommendations are developed by consensus. A working group may establish one or more task forces to develop facts and options on a particular aspect of a given task. The individual task force then provides that information to the working group for consideration. If a working group comes to unanimous consensus on recommendations for action, the package is presented to the full RSAC for a vote. If the proposal is accepted by a simple majority of RSAC, the proposal is formally recommended to FRA. FRA then determines what action to take on the recommendation. Because FRA staff members play an active role at the working group level in discussing the issues and options and in drafting the language of the consensus proposal, FRA is often favorably inclined toward the RSAC recommendation. However, FRA is in no way bound to follow the recommendation, and the agency exercises its independent judgment on whether the recommended rule achieves the agency's regulatory goal, is soundly supported, and is in accordance with policy and legal requirements. Often, FRA varies in some respects from the RSAC recommendation in developing the actual regulatory proposal or final rule. Any such variations would be noted and explained in the rulemaking document issued by FRA. If the working group or full RSAC body is unable to reach consensus on a recommendation for action, FRA moves ahead to resolve the issue(s) through traditional rulemaking proceedings.

E. Establishment of the Passenger Safety Working Group

On May 20, 2003, FRA presented, and RSAC accepted, the task of reviewing existing passenger equipment safety needs and programs and recommending consideration of specific actions that could be useful in advancing the safety of rail passenger service. The RSAC established the Passenger Safety Working Group (Working Group) to handle this task and develop recommendations for the full RSAC to consider. Members of the Working Group, in addition to FRA, include the following:

- AAR, including members from BNSF Railway Company (BNSF), CSX Transportation, Inc., and Union Pacific Railroad Company;
- AAPRCO;
- AASHTO;
- Amtrak;
- APTA, including members from Bombardier, Inc., Herzog Transit Services, Inc., Interfleet Technology, Inc. (formerly LDK Engineering, Inc.), Long Island Rail Road (LIRR), Maryland Transit Administration (MTA), Metro-North Commuter Railroad Company, Northeast Illinois Regional Commuter Railroad Corporation, Southern California Regional Rail Authority, and Southeastern Pennsylvania Transportation Authority;
- BLET;
- BRS;
- FTA;
- HSGTA;
- IBEW;
- NARP;
- RSI;
- SMWIA;
- STA;
- TCIU/BRC;
- TWU; and
- UTU.

Staff from DOT's John A. Volpe National Transportation Systems Center (Volpe Center) attended all of the meetings and contributed to the technical discussions. Staff from the NTSB also participated in the Working Group's meetings. The Working Group has held 13 meetings on the following dates and in the following locations:

- September 9–10, 2003, in Washington, DC;
- November 6, 2003, in Philadelphia, PA;
- May 11, 2004, in Schaumburg, IL;
- October 26–27, 2004, in Linthicum/Baltimore, MD;
- March 9–10, 2005, in Ft. Lauderdale, FL;
- September 7, 2005, in Chicago, IL;
- March 21–22, 2006, in Ft. Lauderdale, FL;
- September 12–13, 2006, in Orlando, FL;
- April 17–18, 2007, in Orlando, FL;
- December 11, 2007, in Ft. Lauderdale, FL;
- June 18, 2008, in Baltimore, MD;
- November 13, 2008, in Washington, DC; and
- June 8, 2009, in Washington, DC.

F. Establishment of the Task Force

Due to the variety of issues involved, at its November 2003 meeting the Working Group established four task forces—smaller groups to develop recommendations on specific issues within each group's particular area of expertise. Members of the task forces include various representatives from the respective organizations that are part of the larger Working Group. One of these task forces was assigned to identify and develop issues and recommendations specifically related to the inspection, testing, and operation of passenger equipment as well as concerns related to the attachment of safety appliances on passenger equipment. An NPRM on these topics was published on December 8, 2005 (*see* 70 FR 73069), and a final rule was published on October 19, 2006 (*see* 71 FR 61835). Another of these task forces was assigned to develop recommendations related to window glazing integrity, structural crashworthiness, and the protection of occupants during accidents and incidents. The work of this task force led to the publication of an NPRM focused on enhancing the front end strength of cab cars and multiple-unit (MU) locomotives on August 1, 2007 (*see* 72 FR 42016), and the publication of a final rule on January 8, 2010 (*see* 75 FR 1180). Another task force, the Emergency Preparedness Task Force, was established to identify issues and develop recommendations related to emergency systems, procedures, and equipment. An NPRM on these topics was published on August 24, 2006 (*see* 71 FR 50276), and a final rule was published on February 1, 2008 (*see* 73 FR 6370). The fourth task force, the Track/Vehicle Interaction Task Force (also identified as the Vehicle/Track Interaction Task Force, or Task Force), was established to identify issues and develop recommendations related to the safety of vehicle/track interactions. Initially, the Task Force was charged with considering a number of issues, including vehicle-centered issues involving flange angle, tread conicity, and truck equalization; the necessity for instrumented wheelset tests for operations at speeds from 90 to 125 m.p.h.; consolidation of vehicle trackworthiness criteria in parts 213 and 238; and revisions of track geometry standards. The Task Force was given the responsibility of addressing other vehicle/track interaction safety issues and to recommend any research necessary to facilitate their resolution. Members of the Task Force, in addition to FRA, include the following:

- AAR;
- Amtrak;
- APTA, including members from Bombardier, Interfleet Technology, Inc., LIRR, LTK Engineering Services, Port Authority Trans-Hudson, and STV Inc.;
- BMWED; and
- BRS.

Staff from the Volpe Center attended all of the meetings and contributed to the technical discussions through their comments and presentations. In addition, staff from ENSCO, Inc., attended all of the meetings and contributed to the technical discussions, as a contractor to FRA. Both the Volpe Center and ENSCO, Inc., have supported FRA in the preparation of this NPRM.

The Task Force has held 28 meetings on the following dates and in the following locations:

- April 20–21, 2004, in Washington, DC;
- May 24, 2004, in Springfield, VA (technical subgroup only);
- June 24–25, 2004, in Washington, DC;
- July 6, 2004, in Washington, DC (technical subgroup only);
- July 22, 2004, in Washington, DC (technical subgroup only);
- August 24–25, 2004, in Washington, DC;
- October 12–14, 2004, in Washington, DC;
- December 9, 2004, in Washington, DC;
- February 10, 2005, in Washington, DC;
- April 7, 2005, in Washington, DC;
- August 24, 2005, in Washington, DC;
- November 3–4, 2005, in Washington, DC;
- January 12–13, 2006, in Washington, DC;
- March 7–8, 2006, in Washington, DC;
- April 25, 2006, in Washington, DC;
- May 23, 2006, in Washington, DC;
- July 25–26, 2006, in Cambridge, MA;
- September 7–8, 2006, in Washington, DC;
- November 14–15, 2006, in Washington, DC;
- January 24–25, 2007, in Washington, DC;
- March 29–30, 2007, in Cambridge, MA;
- April 26, 2007, in Springfield, VA;
- May 17–18, 2007, in Cambridge, MA;
- June 25–26, 2007, in Arlington, VA;
- August 8–9, 2007, in Cambridge, MA;
- October 9–11, 2007 in Washington, DC;
- November 19–20, 2007, in Washington, DC; and
- February 27–28, 2008, in Cambridge, MA.

This list includes meetings of a technical subgroup comprised of representatives of the larger Task Force. These subgroup meetings were often convened the day before the larger Task Force meetings to focus on more advanced, technical issues. The results of these meetings were then presented at the larger Task Force meetings and, in turn, included in the minutes of those Task Force meetings.

G. Development of the NPRM

This NPRM was developed to address a number of the concerns raised and issues discussed during the Task Force and Working Group meetings. Minutes of each of these meetings have been made part of the public docket in this proceeding and are available for inspection.

The Task Force recognized that the high-speed track safety standards are based on the principle that, to ensure safety, the interaction of the vehicles and the track over which they operate must be considered within a systems approach that provides for specific limits for vehicle response to track perturbation(s). From the outset, the Task Force strove to develop revisions that would: Serve as practical standards with sound physical and mathematical bases; account for a range of vehicle types that are currently used and may likely be used on future high-speed or high cant deficiency rail operations, or both; and not present an undue burden on railroads. The Task Force first identified key issues requiring attention based on experience applying the current Track Safety Standards and Passenger Equipment Safety Standards, and defined the following work efforts:

- Revise—
  - Qualification requirements for high-speed or high cant deficiency operations, or both;
  - Acceleration and wheel/rail force safety limits;
  - Inspection, monitoring, and maintenance requirements; and
  - Track geometry limits for high-speed operations.
- Establish—
  - Necessary safety limits for wheel profile and truck equalization;
  - Consistent requirements for high cant deficiency operations covering all track classes; and
  - Additional track geometry requirements for cant deficiencies greater than 5 inches.
- Resolve and reconcile inconsistencies between the Track Safety Standards and Passenger Equipment Safety Standards, and between the lower- and higher-speed Track Safety Standards.

Through the close examination of these issues, the Task Force developed proposals intended to result in improved public safety while reducing the burden on the railroad industry where possible. The proposals were arrived at through the results of computer simulations of vehicle/track dynamics, consideration of international practices, and thorough reviews of qualification and revenue service test data.

Nonetheless, FRA makes clear that the Task Force did not seek to revise comprehensively the high-speed Track Safety Standards in subpart G of part 213, and this NPRM does not propose to do so. For example, there was no consensus within the Task Force to consider revisions to the requirements for crossties, as members of the Task Force believed it was outside of their assigned tasks. Nor was there any real discussion about revisions to the requirements for ballast or other sections in subpart G that currently do not distinguish requirements by class of track. (*See* § 213.307 in the Section-by-Section Analysis, below, for further discussion on this point.) FRA therefore makes clear that by not proposing revisions to these sections in this NPRM, FRA does not mean to imply that these other sections may not be subject to revision in the future. These sections may be addressed through a separate RSAC effort. Further, FRA does invite comment on the need and rationale for changes to other sections of subpart G not specifically proposed to be revised through this NPRM, and based upon the comments received and their significance to the changes specifically proposed herein, FRA may consider whether revisions to additional requirements in subpart G are necessary in the final rule arising from this rulemaking.

Overall, this NPRM is the product of FRA's review, consideration, and acceptance of recommendations made by the Task Force, Working Group, and full RSAC. FRA refers to comments, views, suggestions, or recommendations made by members of the Task Force, Working Group, or full RSAC, as they are identified or contained in the minutes of their meetings. FRA does so to show the origin of certain issues and the nature of discussions concerning those issues at the Task Force, Working Group, and full RSAC level. FRA believes this serves to illuminate factors it has weighed in making its regulatory decisions, as well as the logic behind those decisions. The reader should keep in mind, of course, that only the full RSAC makes recommendations to FRA. As noted above, FRA is in no way bound to follow RSAC's recommendations, and the agency exercises its independent judgment on whether the rule achieves the agency's regulatory goal(s), is soundly supported, and is in accordance with policy and legal requirements. FRA believes that this NPRM is consistent with RSAC's recommendations, with the notable exception of FRA's proposal concerning Class 9 track. Please *see* the discussion of Class 9 track in § 213.307 of the Section-by-Section Analysis, below.

III. Technical Background

A. Lessons Learned and Operational Experience

Since the issuance of both the high-speed Track Safety Standards in 1998 and the Passenger Equipment Safety Standards in 1999, experience has been gained in qualifying a number of vehicles for high-speed and high cant deficiency operations and in monitoring subsequent performance in revenue service operation. These vehicles include Amtrak's Acela Express trainset; MTA's MARC–III multi-level passenger car; and New Jersey Transit Rail Operations' (NJTR) ALP–46 locomotive, Comet V car, PL–42AC locomotive, and multi-level passenger car. Considerable data was gathered by testing these vehicles at speed over their intended service routes using instrumented wheelsets to directly measure forces between the wheel and rail and using accelerometers to record vehicle motions. During the course of these qualification tests, some uncertainties, inconsistencies, and potentially restrictive values were identified in the interpretation and application of the vehicle/track interaction (VTI) safety limits currently specified in § 213.333 and § 213.345 for excessive vehicle motions based on measured accelerations and in the requirements of § 213.57 and § 213.329 for high cant deficiency operation. This information and experience in applying the current requirements are the foundation for a number of the proposals in this NPRM, examples of which are provided below.

Differentiate Between Sustained and Transient Carbody Acceleration Events

During route testing of the MARC–III multi-level car at speeds to 125 m.p.h. and at curving speeds producing up to 5 inches of cant deficiency, several short-duration, peak-to-peak carbody lateral accelerations were recorded that exceeded current thresholds but did not represent unsafe guidance forces simultaneously measured at the wheel-to-rail interface. Yet, sustained, carbody lateral oscillatory accelerations and significant motions were measured on occasion at higher speeds in curves even though peak-to-peak amplitudes did not exceed current thresholds. In addition, a truck component issue was identified and corrected.

To recognize and account for wider variations in vehicle design, the VTI acceleration limits for carbody motions are proposed to be divided into separate limits for passenger cars from those for other vehicles, such as conventional locomotives. In addition, new limits for sustained, carbody oscillatory accelerations are proposed to be added to differentiate between single (transient) events and repeated (sustained) oscillations. As a result, the carbody transient acceleration limits for single events, previously set conservatively to control for both single and repeated oscillations, can be made more specific and relaxed as appropriate. FRA believes that this added specificity in the rule would reduce or eliminate altogether the need for railroads to provide clarification or perform additional analysis, or both, following a qualification test run to distinguish between transient and sustained oscillations. Based on the small energy content associated with high-frequency acceleration events of the carbody, any transient acceleration peaks lasting less than 50 milliseconds are proposed to be excluded from the carbody acceleration limits. Other clarifying changes include the proposed addition of minimum requirements for sampling and filtering of the acceleration data. These changes were proposed after considerable research into the performance of existing vehicles during qualification testing and revenue operations. Overall, it was found that the existing carbody oscillatory acceleration limits need not be as stringent to protect against events leading to vehicle or passenger safety issues.

Establish Consistent Requirements for High Cant Deficiency Operations for All Track Classes

Several issues related to operation at higher cant deficiencies (higher speeds in curves) have also been addressed, based particularly on route testing of the Acela trainsets on Amtrak's Northeast Corridor. In sharper curves, for which cant deficiency was high but vehicle speeds were reflective of a lower track class, it was found that stricter track geometry limits were necessary, for the same track class, in order to provide an equivalent margin of safety for operations at higher cant deficiency. Second, although the current Track Safety Standards prescribe limits on geometry variations existing in isolation, it was recognized that a combination of alinement and surface variations, none of which individually amounts to a deviation from the Standards, may nonetheless result in undesirable response as defined by the VTI limits. This finding is significant because trains operating at high cant deficiency increase the lateral force exerted on track during curving and, in many cases, may correspondingly reduce the margin of safety associated with vehicle response to combined track variations. Qualification of Amtrak's conventional passenger equipment to operate at cant deficiencies up to 5 inches has also highlighted the need to ensure compatibility between the requirements for low- (§ 213.57) and high-speed (§ 213.329) operations.

Streamline Testing Requirements for Similar Vehicles

This NPRM includes a proposal that vehicles with minor variations in their physical properties (such as suspension, mass, interior arrangements, and dimensions) that do not result in significant changes to their dynamic characteristics be considered of the same type for vehicle qualification purposes. If such similarity can be established to FRA's satisfaction, such vehicles would not be required to undergo full qualification testing, which can be more costly. In other cases, however, the variations between car parameters may warrant partial or full dynamic testing. For example, the approval process for NJTR's Comet V car to operate at speeds up to 100 m.p.h. exemplified the need for clarification of whether vehicles similar (but not identical) to vehicles that have undergone full qualification testing should be subjected to full qualification testing themselves. NJTR had sought relief from the instrumented wheelset testing required in § 213.345 by stating that the Comet V car was similar to the Comet IV car. The Comet V car was represented to FRA to have truck and suspension components nearly identical to the Comet IV car already in service and operating at 100-m.p.h. speeds for many years. However, examination by FRA revealed enough differences between the vehicles to at least warrant dynamic testing using accelerometers on representative routes. Results of the testing showed distinct behaviors between the cars and provided additional data that was necessary for qualifying the Comet V.

Refine Criteria for Detecting Truck Hunting

During route testing of Acela trainsets, high-frequency lateral acceleration oscillations of the coach truck frame were detected by the test instrumentation in a mild curve at high speed. However, the onboard sensors, installed per specification on every truck, did not respond to these events. Based on these experiences, the truck lateral acceleration limit, used for the detection of truck hunting, is proposed to be tightened from 0.4g to 0.3g and include a requirement that the value must exceed that limit for more than 2 seconds for there to be an exceedance. Analyses conducted by FRA have shown that this would help to better identify the occurrences of excessive truck hunting, while excluding high-frequency, low-amplitude oscillations that would not require immediate attention. In addition, to improve the process for analyzing data while the vehicle is negotiating spiral track segments, the limit would now require that the RMSt (root mean squared with linear trend removed) value be used rather than the RMSm (root mean squared with mean removed) value.

Finally, placement of the truck frame lateral accelerometer to detect truck hunting would be more rigorously specified to be as near an axle as is practicable. Analyses conducted by FRA have shown that when hunting motion (which is typically a combination of truck lateral and yaw) has a large truck yaw component, hunting is best detected by placing an accelerometer on the truck frame located above an axle. An accelerometer placed in the middle of the truck frame will not always provide early detection of truck hunting when yaw motion of the truck is large.

Revise Periodic Monitoring Requirements for Class 8 and 9 Track

Based on data collected to date, and so that the required inspection frequency better reflects experienced degradation rates, the periodic vehicle/track interaction monitoring frequency contained in § 213.333 for operations at track Class 8 and 9 speeds is proposed to be reduced from once per day to four times per week for carbody accelerations, and twice within 60 days for truck accelerations. In addition, a clause is proposed to be added to allow the track owner or railroad operating the vehicle type to petition FRA, after a specified amount of time or mileage, to eliminate the truck accelerometer monitoring requirement. Data gathered has shown that these monitoring requirements may be adjusted without materially diminishing operational safety. Nonetheless, FRA notes that in addition to these requirements, pursuant to § 238.427, truck acceleration would continue to be constantly monitored on each Tier II vehicle under the Passenger Equipment Safety Standards in order to determine if hunting oscillations of the vehicle are occurring during revenue operation.

B. Research and Computer Modeling

As a result of advancements made over the last few decades, computer models of rail vehicles interacting with track have become practical and reliable tools for predicting the behavior and safety of rail vehicles under specified conditions. These models can serve as reliable substitutes for performing actual, on-track testing, which otherwise may be more difficult—and likely more costly—to perform than to model.

Models for such behavior typically represent the vehicle body, wheelsets, truck frames, and other major vehicle components as rigid bodies connected with elastic and damping elements and include detailed representation of the non-linear wheel/rail contact mechanics (*i.e.,* non-linear frictional contact forces between the wheels and rails modeled as functions of the relative velocities between the wheel and rail contacts, *i.e.,* creepages). The primary dynamic input to these models is track irregularities, which can be created analytically (such as versines, cusps, *etc.*) or based on actual measurements.

There are a number of industry codes available with generally-accepted approaches for solving the equations of motion describing the dynamic behavior of rail vehicles. These models require accurate knowledge of vehicle parameters, including the inertia properties of each of the bodies as well as the characteristics of the main suspension components and connections. To obtain reliable predictions, the models must also consider the effects of parameter non-linearities within the vehicles and in the wheel/rail contact mechanics, as well as incorporate detailed characterization of the track as input including the range of parameters and non-linearities encountered in service.

In order to develop the proposed revisions to track geometry limits in the Track Safety Standards, several computer models of rail vehicles have been used to assess the response of vehicle designs to a wide range of track conditions corresponding to limiting conditions allowed for each class of track. Simulation studies have been performed using computer models of Amtrak's AEM–7 locomotive, Acela power car, Acela coach car, and Amfleet coach equipment. Since the 1998 revisions to the track geometry limits, which were based on models of hypothetical, high-speed vehicles, models of the subsequently-introduced Acela power car and coach car have been developed. In the case of the Acela power car, the model proved capable of reproducing a wide range of vehicle responses observed during acceptance testing, including examples of potential safety concerns.

For purposes of this NPRM, an extensive matrix of simulation studies involving all four vehicle types was used to determine the amplitude of track geometry alinement anomalies, surface anomalies, and combined surface and alinement anomalies that result in undesirable response as defined by the proposed revision to the VTI limits. These simulations were performed using two coefficients of friction (0.1 and 0.5), two analytical anomaly shapes (bump and ramp), and combinations of speed, curvature, and superelevation to cover a range of cant deficiency. The results provided the basis for establishing the refinements to the geometry limits proposed in this NPRM. For illustration purposes, two examples of results from the simulation studies that were performed for determining safe amplitudes of track geometry are being provided in this document: one illustrates the effect of combined geometry defects; the other illustrates isolated alinement geometry defects.

Figure 1 depicts an example summarizing the results of the Acela power car at 130 m.p.h. and 9 inches of cant deficiency over combined 124-foot wavelength defects. The darker-shaded squares represent a combination of alinement and surface perturbations where at least one of the proposed VTI safety criteria is exceeded, and the solid, black-lined polygon represents the proposed track geometry limits. Similar results for other cars, speeds and cant deficiencies, and defect wavelengths were created and reviewed. As shown, without the addition of the combined defect limit in the upper right and lower left corners (which has the effect of limiting geometry in the up-and-in and down-and-out corners), the single-defect limits would permit track geometry conditions that could cause the proposed VTI safety criteria to be exceeded. For many of these high-speed and high cant deficiency conditions, the net axle lateral force safety criterion was found to be the limiting safety condition.

Figure 2 depicts an example result for the single-defect simulations, summarizing the response of the Acela power car at 130 m.p.h. and 9 inches of cant deficiency over isolated alinement defects. Each vertical bar represents the amplitude of the largest alinement perturbation that will not cause an exceedance of one of the proposed VTI safety criteria. Similar results for other cars, speeds and cant deficiencies, and defect wavelength were created and reviewed. In addition, similar results for this range of analysis parameters (cars, speeds and cant deficiencies, and defect wavelength) were created and reviewed using isolated, surface geometry defects. These example results show that, with one exception, current limits sufficiently protect against such exceedances under the modeled conditions. The proposed VTI limit for net axle lateral force was not found to be met under the existing 124-foot mid-chord offset (MCO) geometry limit for track alinement, which the modeling showed to be set too permissively. Consequently, FRA is proposing to tighten this geometry limit to prevent unsafe vehicle dynamic response.

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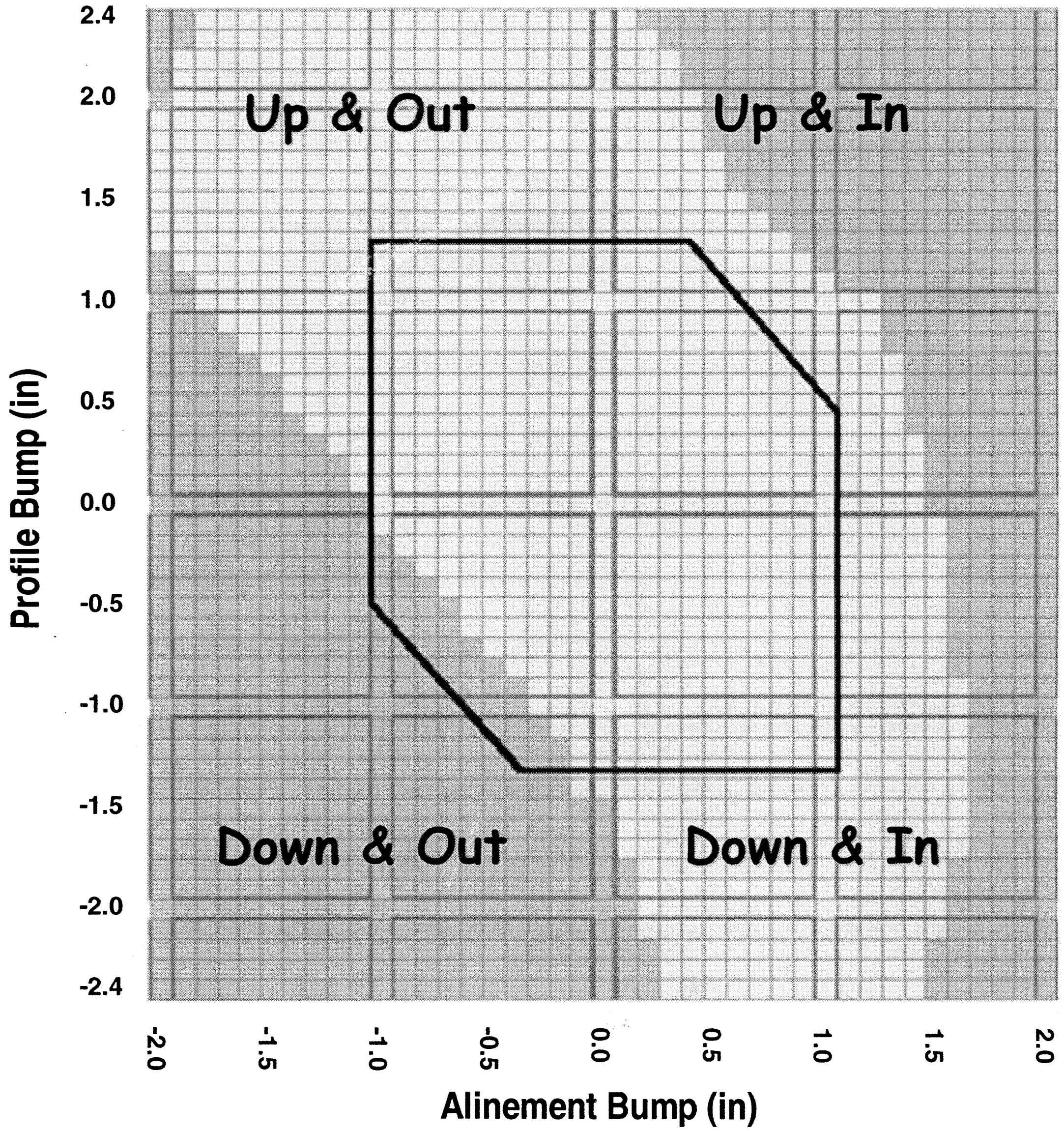

Figure 1. Combined Alinement and Profile (Surface) Deviations, 124-foot Wavelength, Acela Power Car, 130 m.p.h., 9 inches (in) of Cant Deficiency

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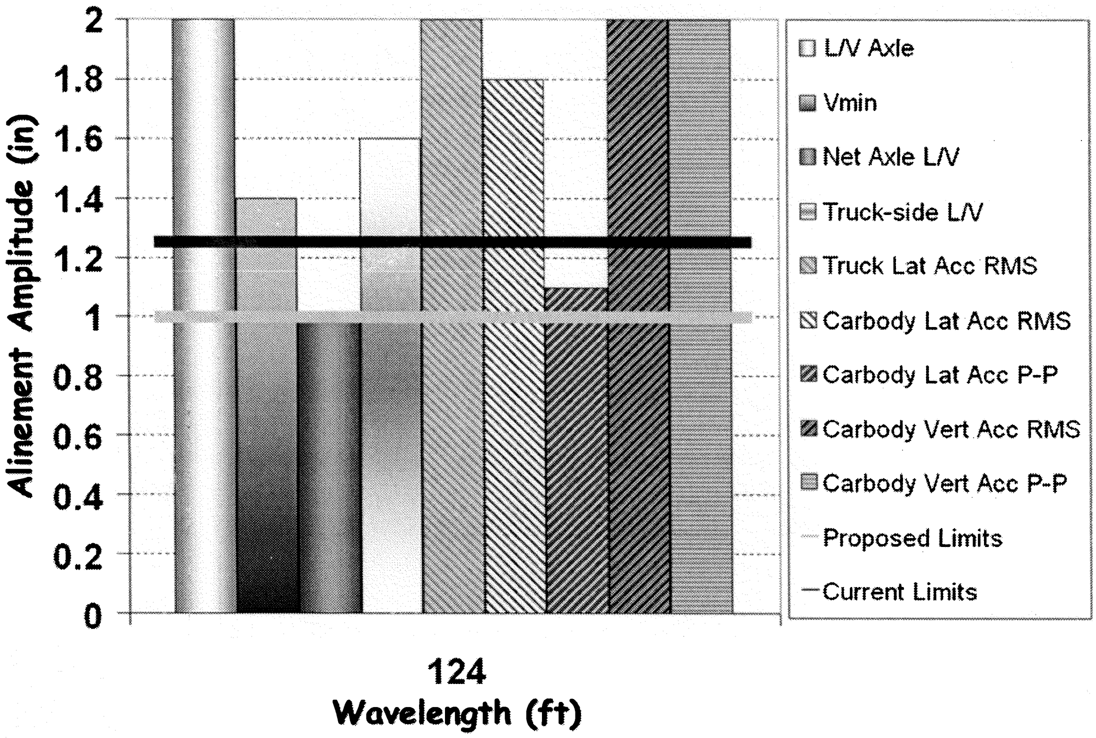

Figure 2. Isolated Alinement Deviations, 124-foot Wavelength, Acela Power Car, 130 m.p.h., 9 inches of Cant Deficiency

As part of this proposed rule, and as discussed further in the Section-by-Section Analysis, simulations using computer models would be required during the vehicle qualification process as an important tool for the assessment of vehicle performance. These simulations are intended not only to augment on-track, instrumented performance assessments but also to provide a means for identifying vehicle dynamic performance issues prior to service to validate suitability of a vehicle design for operation over its intended route. In order to evaluate safety performance as part of the vehicle qualification process, simulations would be conducted using both a measured track geometry segment representative of the full route, and an analytically-defined track segment containing geometry perturbations representative of minimally compliant track conditions for the respective class. This Minimally Compliant Analytical Track (or MCAT) would be used to qualify both new vehicles for operation and vehicles previously qualified (on other routes) for operation over new routes. MCAT consists of nine sections; each section is designed to test a vehicle's performance in response to a specific type of perturbation (hunting perturbation, gage narrowing, gage widening, repeated and single surface perturbations, repeated and single alinement perturbations, short warp, and combined down-and-out perturbations). Typical simulation parameters (that are to be varied) include: speed, cant deficiency, gage, and wheel profile. Figure 3 depicts time traces of the percent of wheel unloading for the Acela coach in a simulated run over MCAT segments that would be required for analyzing high cant deficiency curving performance at 160 m.p.h.

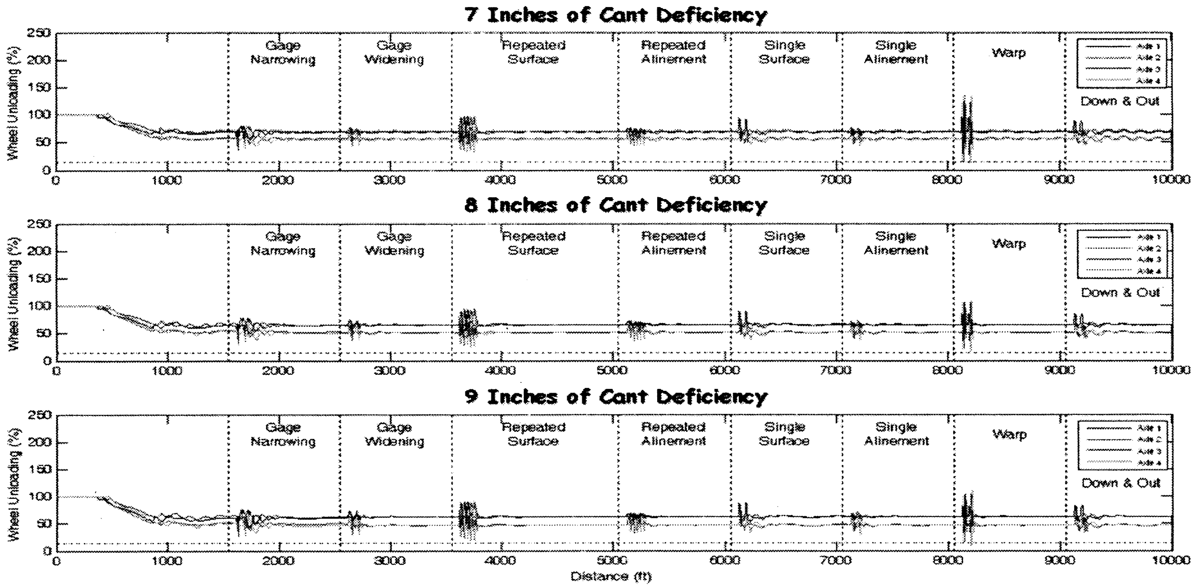

Figure 3. V_{min}, Acela Coach, 160 m.p.h., 31-foot Perturbations

IV. Section-by-Section Analysis

Proposed Amendments to 49 CFR Part 213, Track Safety Standards

Subpart A—General

Section 213.1 Scope of Part

This section was amended in the 1998 Track Safety Standards final rule to distinguish the applicability of subpart G from that of subparts A through F, as a result of subpart G's addition to this part by that final rule. Subpart G applies to track over which trains are operated at speeds exceeding those permitted for Class 5 track, which supports maximum speeds of 80 m.p.h. for freight trains and 90 m.p.h. for passenger trains. Subpart G was intended to be comprehensive, so that a railroad operating at speeds above Class 5 maximum speeds may refer to subpart G for all of the substantive track safety requirements for high-speed rail and need refer to the sections of the Track Safety Standards applicable to lower-speed operations only for the general provisions at § 213.2 (Preemptive effect), § 213.3 (Application), and § 213.15 (Penalties). At the same time, railroads that do not operate at speeds in excess of the maximum Class 5 speeds need not directly refer to subpart G at all.

FRA seeks to maintain this general structure of part 213 for ease of use, and the requirements of subpart G would continue not to apply directly to operations at Class 1 through 5 track speeds. However, in proposing to add new requirements governing high cant deficiency operations for track Classes 1 through 5, certain sections of subparts C and D would refer railroads operating at high cant deficiencies to specific sections of subpart G. In such circumstances, only the specifically-referenced section(s) of subpart G would apply, and only as provided. As discussed in this Section-by-Section Analysis, below, the proposed addition of requirements for high cant deficiency operations over lower-speed track classes would permit railroads to operate at higher cant deficiencies over these track classes by complying with the terms of the regulation instead of a waiver. Currently, railroads must petition FRA for a waiver and then obtain FRA's approval to operate at high cant deficiencies over lower-speed track classes.

FRA believes that the approach proposed in this rulemaking would minimize the addition of detailed requirements for high cant deficiency operations in subparts C and D. Moreover, FRA does not believe it necessary to amend this section on the scope of this part, because only certain requirements of subpart G would apply to lower-speed track classes and only indirectly through cross-references to those requirements in subpart G for high cant deficiency operations. FRA believes that this approach is consistent with the current organization of this part, as existing § 213.57 already references subpart G for when a track owner or railroad operating above Class 5 track speeds requests approval to operate at greater than 4 inches of cant deficiency on curves in Class 1 through 5 track contiguous to the high-speed track. Nonetheless, FRA invites both comment on this proposed approach and suggestions for any alternative approach for maintaining the ease of use of this part. In this regard, FRA invites comment on whether the subpart headings should be modified to make their application clearer to the rail operations they address, and, if so, in what way(s).

As a separate matter, FRA notes that it is not proposing to revise and re-issue the Track Safety Standards in full, as was done in the 1998 final rule. Instead, FRA is proposing to amend only certain portions of the Track Safety Standards. Therefore, the final rule arising from this rulemaking will need to ensure that both the new and revised sections appropriately integrate with those sections of this part that are not amended, and that appropriate time is provided to phase-in the new and amended sections. In general, the Task Force recommended that both new and revised sections become applicable one year after the date the final rule is published. This phase-in period is intended to allow the track owner or operating railroad, or both, sufficient time to prepare for and adjust to meeting the new requirements. Examples of such adjustments may include changes to operating, inspection, or maintenance practices, such as for compliance with §§ 213.57, 213.329, 213.332, 213.333 and 213.345, as they would be revised.

FRA is also considering providing the track owner or operating railroad the option of electing to comply sooner with the new and amended requirements, upon written notification to FRA. Such a request for earlier application of the new and amended requirements would indicate the track owner's or railroad's readiness and ability to comply with all of the new and amended requirements—not just certain of those requirements. Because of the interrelationship of the proposed changes, FRA believes that virtually all of the changes would need to apply at the same time to maintain their integrity. FRA invites comment on formalizing this approach for the final rule. FRA does note that since it intends for the final rule to become effective 60 days after its publication, and since there cannot be two different sections of the same CFR unit under the same section heading, FRA may need to move current sections of part 213 that would be revised to a temporary appendix to allow for continued compliance with those sections for a track owner or railroad electing not to comply sooner with the revised sections of part 213. Use of such an appendix would be consistent with FRA practice.

Section 213.7 Designation of Qualified Persons To Supervise Certain Renewals and Inspect Track

This section recognizes that work on or about a track structure supporting heavy freight trains or passenger operations, or both, demands the highest awareness of employees of the need to perform their work properly. At the same time, the current wording of this section literally requires that each individual designated to perform such work know and understand the requirements of this part, detect deviations from those requirements, and prescribe appropriate remedial action to correct or safely compensate for those deviations, regardless whether that knowledge, understanding, and ability with regard to all of this part is necessary for that individual to perform his or her duties. While qualified persons designated under this section have not been directly required to know, understand, and apply the requirements of subpart G (pursuant to § 213.1(b)), the proposed addition of vehicle qualification and testing requirements for high cant deficiency operations in these lower-speed track classes would in particular add a level of complexity that may be outside of the purview of track foremen and inspectors in fulfilling their duties.

As a result, the Task Force recommended and FRA agrees that this rulemaking make clear that the requirements for a person to be qualified under this section concern those portions of this part necessary for the performance of that person's duties. FRA is therefore proposing to add to the end of paragraph (a)(2)(i) the words "that apply to the restoration and renewal of track for which he or she is responsible," and to add to the end of paragraph (b)(2)(i) the words "that apply to the inspection of track for which he or she is responsible." This proposal would continue to require that a person designated under this section possess the knowledge, understanding, and ability necessary to supervise the restoration and renewal of track, or to perform inspections of track, or both, for which he or she is responsible. Yet, this proposal would make clear that the person would not be required to know, understand, or apply specific requirements of this part not necessary to the fulfillment of that person's duties. FRA does not believe that safety would be in any way diminished by this proposal. FRA does believe that this clarification is consistent with the intent of the Track Safety Standards.

Subpart C—Track Geometry

Section 213.55 Track Alinement

This section specifies the maximum alinement deviations allowed for tangent and curved track in Classes 1 through 5. Alinement (also spelled "alignment" and literally meant to indicate "a line") is the localized variation in curvature of each rail. On tangent track, the intended curvature is zero, and thus the alinement is measured as the variation or deviation from zero. In a curve, the alinement is measured as the variation or deviation from the "uniform" alinement over a specified distance.

FRA is proposing to modify the section heading so that it reads "Track alinement," instead of "Alinement," to better conform with the format of other sections in the part. The primary change to this section would be the addition of a new paragraph (b) containing tighter, single-deviation geometry limits for operations above 5 inches of cant deficiency on curved track. These limits would include both 31-foot and 62-foot MCO limits. A footnote would be added for track Classes 1 and 2 in paragraph (b), noting that restraining rails or other systems may be required for derailment prevention. The current limits in paragraph (a) would remain unchanged. FRA believes that adding the track geometry limits in paragraph (b) is necessary to provide an equivalent margin of safety for operations at higher cant deficiency. These proposed limits are based on the results of simulation studies, as discussed in section III.B. of the preamble, above, to determine the safe amplitudes of track geometry alinement variations. For higher cant deficiency operations, curved track geometry limits are to be applied only when track curvature is greater than 0.25 degree.

Section 213.57 Curves; Elevation and Speed Limitations

In general, this section specifies the requirements for safe curving speeds in track Classes 1 through 5. FRA is proposing substantial changes to this section, including modification and clarification of the qualification requirements and approval process for vehicles intended to operate at more than 3 inches of cant deficiency. For consistency with the higher speed standards in subpart G, cant deficiency would no longer be limited to a maximum of 4 inches in track Classes 1 through 5. Currently, this section specifies qualification requirements for vehicles intended to operate at up to only 4 inches of cant deficiency on track Classes 1 through 5 unless the track is contiguous to a higher-speed track. Consequently, vehicles intended to operate at more than 4 inches of cant deficiency on routes not contiguous to a higher-speed track currently must file for and obtain a waiver in accordance with part 211 of this chapter. FRA is therefore proposing to establish procedures for such vehicles to operate safely at greater than 4 inches of cant deficiency without the necessity of obtaining a waiver.

Paragraph (a) would be revised in two respects. The first sentence of paragraph (a) currently provides that the maximum crosslevel of the outside rail of a curve may not be more than 8 inches on track Classes 1 and 2, and 7 inches on Classes 3 through 5. This requirement would be restated to provide that the maximum elevation of the outside rail of a curve may not be more than 8 inches on track Classes 1 and 2, and 7 inches on track Classes 3 through 5. Crosslevel is a function of elevation differences between two rails, and is the focus of other provisions of this proposal, specifically § 213.63, Track surface. The proposed clarification here is intended to limit the elevation of a single rail.

The Task force had recommended removing the second sentence, which provides that "[e]xcept as provided in § 213.63, the outside rail of a curve may not be lower than the inside rail." Concern had been raised in the Task Force that this statement potentially conflicts with the limits in § 213.63 for "the deviation from * * * reverse crosslevel elevation on curves." FRA has decided that the second sentence of paragraph (a) should be re-written more clearly to restrict configuring track so that the outside rail of a curve is designed to be lower than the inside rail, while allowing for a deviation of up to the limits provided in § 213.63. This requirement in paragraph (a) is intended to restrict configuring track so that the outside rail of a curve is, by design, lower than the inside rail; the limits at issue in § 213.63 govern local deviations from uniform elevation—from the designed elevation—that occur as a result of changes in conditions. Rather than conflict, these provisions complement each other, addressing both the designed layout of a curve and deviations from that layout through actual use.

Paragraph (b) has been added to address potential vehicle rollover and passenger safety issues should a vehicle be stopped or traveling at very low speed on superelevated curves. For this cant-excess condition the rule would require that all vehicles requiring qualification under § 213.345 must demonstrate that when stopped on a curve having a maximum uniform elevation of 7 inches, no wheel unloads to a value less than 50 percent of its static weight on level track. This requirement would include an allowance for side-wind loading on the vehicle to prevent complete unloading of the wheels on the high (elevated) rail and incipient rollover.

In paragraph (c), the V_{max} formula sets the maximum allowable operating speed for curved track based on the qualified cant deficiency (inches of unbalance), E_u, for the vehicle type. Clarification would be added in a new footnote 2 to allow the vehicle to operate at the cant deficiency for which it is approved, E_u, plus 1 inch, if actual elevation of the outside rail, E_a, and degree of track curvature, D, change as a result of track degradation. This 1-inch margin would provide a tolerance to account for the effects of local crosslevel or curvature conditions on V_{max} that may result in the operating cant deficiency exceeding that approved for the equipment. Without this tolerance, these conditions could generate a limiting speed exception, and some railroads have adopted the approach of reducing the operating cant deficiency of the vehicle in order to avoid these exceptions.

FRA also notes that it was the consensus of the Task Force to clarify footnote 1 to state, in part, that actual elevation, E_a, for each 155-foot track segment in the body of the curve is determined by averaging the elevation for 11 points through the segment at 15.5-foot spacing—instead of 10 points, as expressly provided in the current footnote. FRA's Track Safety Standards Compliance Manual (Manual) explains that the "actual elevation and curvature to be used in the [V_{max}] formula are determined by averaging the elevation and curvature for 10 points, including the point of concern for a total of 11, through the segment at 15.5-[foot] station spacing." *See* the guidance on § 213.57 provided in Chapter 5 of the Manual, which is available on FRA's Web site at *http://www.fra.dot.gov/downloads/safety/track_compliance_manual/TCM%205.PDF.* This clarification to footnote 1 would make the footnote more consistent with the manner in which the rule is intended to be applied.

Existing footnote 2 would be redesignated as footnote 3 without substantive change.

Paragraph (d) would provide that all vehicle types are considered qualified for up to 3 inches of cant deficiency, as allowed by the current rule.

Paragraph (e) would be modified to specify the requirements for vehicle qualification over track with more than 3 inches of cant deficiency. The existing static lean requirements for 4 inches of cant deficiency limit the carbody roll to 5.7 degrees with respect to the horizontal when the vehicle is standing on track with 4 inches of superelevation, and limit the vertical wheel load remaining on the raised wheels to no less than 60% of their static level values and carbody roll to 8.6 degrees with respect to the horizontal when the vehicle is standing (stationary) on track with 6 inches of superelevation. The proposed requirements would not limit the cant deficiency to 4 inches, and would not impose the 6-inch superelevation static lean requirement specifically for 4-inch cant deficiency qualification. The latter requirement is intended to be addressed in paragraph (b), as discussed above, for all vehicles requiring qualification under § 213.345.

The proposed requirements in paragraph (e) could be met by either static or dynamic testing. The static lean test would limit the vertical wheel load remaining on the raised wheels to no less than 60% of their static level values and the roll of a passenger carbody to 8.6 degrees with respect to the horizontal, when the vehicle is standing on track with superelevation equal to the intended cant deficiency. The dynamic test would limit the steady-state vertical wheel load remaining on the low rail wheels to no less than 60% of their static level values and the lateral acceleration in a passenger car to 0.15g steady-state, when the vehicle operates through a curve at the intended cant deficiency. (Please note that steady-state, carbody lateral acceleration, *i.e.,* the tangential force pulling passengers to one side of the carbody when traveling through a curve at higher than the balance speed, should not be confused with sustained, carbody lateral oscillatory accelerations, *i.e.,* continuous side-to-side oscillations of the carbody in response to track conditions, whether on curved or tangent track.) This 0.15g steady-state lateral acceleration limit in the dynamic test would provide consistency with the 8.6-degree roll limit in the static lean test, in that it corresponds to the lateral acceleration a passenger would experience in a standing vehicle whose carbody is at a roll angle of 8.6 degrees with respect to the horizontal. The 5.7-degree roll limit, which limits steady-state, carbody lateral acceleration to 0.1g, would be eliminated from the existing rule.

Measurements and supplemental research indicate that a steady-state, carbody lateral acceleration limit of 0.15g is considered to be the maximum, steady-state lateral acceleration above which jolts from vehicle dynamic response to track deviations can present a hazard to passenger safety. While other FRA vehicle/track interaction safety criteria principally address external safety hazards that may cause a derailment, such as damage to track structure and other conditions at the wheel/rail interface, the steady-state carbody lateral acceleration limit specifically addresses the safety of the interior occupant environment. For comparison purposes, it is notable that European standards, such as International Union of Railways (UIC) Code 518, Testing and Approval of Railway Vehicles from the Point of View of Their Dynamic Behaviour—Safety—Track Fatigue—Ride Quality, have adopted a steady-state, carbody lateral acceleration limit of 0.15g. FRA does recognize that making a comparison with such a specific limit in another body of standards needs to take into account what related limits are provided in the compared standards and what the nature of the operating environment is to which the compared standards apply. FRA therefore invites comment whether such a comparison is appropriate here—whether, for example, there are enhanced or additional vehicle/track safety limits that apply to European operations, either through industry practice or governing standards, or both.

Increasing the steady-state, carbody lateral acceleration limit from 0.1g to 0.15g would allow for operations at higher cant deficiency on the basis of acceleration before tilt compensation is necessary. This increase in cant deficiency without requiring tilt compensation would be larger for a vehicle design whose carbody is less disposed to roll on its suspension when subjected to an unbalance force, since carbody roll on curved track has a direct effect on steady-state, carbody lateral acceleration. For example, a vehicle having a completely rigid suspension system (S = 0) would have no carbody roll and could operate without a tilt system at a cant deficiency as high as 9 inches, at which point the steady-state, carbody lateral acceleration would be 0.15g, which would correlate to an 8.6-degree roll angle between the floor and the horizontal when the vehicle is standing on a track with 9 inches of superelevation. The suspension coefficient "S" is the ratio of the roll angle of the carbody on its suspension (measured relative to the inclination of the track) to the cant angle of the track (measured relative to the horizontal) for a stationary vehicle standing on a track with superelevation. A suspension coefficient of 0 is theoretical but neither practical nor desirable, because of the need for flexibility in the suspension system to handle track conditions and provide for occupant comfort and safety. Assuming that a car has some flexibility in its suspension system, say S = 0.3, the car could operate without a tilt system at a cant deficiency as high as approximately 7 inches, at which point the steady-state, carbody lateral acceleration would be 0.15g, which would correlate to an 8.6-degree roll angle between the floor and the horizontal when the vehicle is standing on track with 7 inches of superelevation. To operate at higher cant deficiencies and not exceed these limits, the vehicle would need to be equipped with a tilt system so that the floor actively tilts to compensate for the forces that would otherwise cause these limits to be exceeded.

Under current FRA requirements, using the above examples, a vehicle having a completely rigid suspension system (S = 0) could operate without a tilt system at a cant deficiency no higher than 6 inches, at which point the steady-state, carbody lateral acceleration would be 0.1g, which would correlate to a 5.7-degree roll angle between the floor and the horizontal when the vehicle is standing on track with 6 inches of superelevation. Assuming that a vehicle has some flexibility in its suspension system, again say S = 0.3, the vehicle could operate without a tilt system at a cant deficiency no higher than approximately 4.7 inches, at which point the steady-state, carbody lateral acceleration would be 0.1g, which would correlate to a 5.7-degree roll angle between the floor and the horizontal when the vehicle is standing on track with 4.7 inches of superelevation.

FRA notes that the less stringent steady-state, carbody lateral acceleration limit and carbody roll angle limit proposed in this rule would reduce the need to equip vehicles with tilt systems at higher cant deficiencies—and seemingly the costs associated with such features, as well. Moreover, by facilitating higher cant deficiency operations, savings could also result from shortened trip times. These savings could be particularly beneficial to passenger operations in emerging high-speed rail corridors, enabling faster operations through curves.

Of course, any such savings should not come at the expense of safety, and FRA is proposing additional track geometry requirements for operations above 5 inches of cant deficiency, whether or not the vehicles are equipped with tilt systems. These additional track geometry requirements were developed to control for undesirable vehicle response to track conditions that could pose derailment concerns. They may also help to control in some way for transient, carbody acceleration events that could pose ride safety concerns for passengers subjected to higher steady-state, carbody lateral acceleration levels, but they were not specifically developed to address such concerns and their effect has not been modeled. These additional track geometry requirements are being proposed to apply only to operations above 5 inches of cant deficiency, where steady-state, carbody lateral acceleration would approach 0.15g for typical vehicle designs. In this regard, during Task Force discussions, Amtrak stated that Amfleet equipment has been operating at up to 5 inches of cant deficiency (with approximately 0.13g steady-state, carbody lateral acceleration levels) without resulting in passenger ride safety issues. FRA is also not aware of any general passenger safety issue involving passengers losing their balance and falling due to excessive steady-state, carbody lateral acceleration levels in current operations.

Nonetheless, a transient carbody acceleration event that poses no derailment safety concern could very well cause a standing passenger to lose his or her balance and fall. Although FRA is not aware of much published data on the effect transient, carbody acceleration events have on passenger ride safety, it is recognized that the presence of steady-state, carbody lateral acceleration will generally reduce the margin of safety for standing passengers to withstand transient, lateral acceleration events and not lose their balance. If such passenger ride safety issues were more clearly identified, additional track geometry or other limits could potentially be proposed to address them. However, based on the information available to the Task Force, it did not recommend additional limits to address potential passenger ride safety concerns that may result from transient, carbody acceleration events alone or when combined with steady-state, carbody lateral acceleration. The Task Force also took into account that, as a mode of transportation offered to the general public, passenger rail travel need provide for passenger comfort. As a result, the riding characteristics of passenger rail vehicles should by railroad practice be held first to acceptable passenger ride comfort criteria, which would be more stringent than those for passenger ride safety.

To fully inform FRA's decisions in preparing the final rule arising from this NPRM, FRA is specifically inviting public comment on this discussion and the proposal to set the steady-state, carbody lateral acceleration limit at 0.15g. FRA requests specific comment on whether the proposed rule appropriately provides for passenger ride safety, and if not, requests that the commenters state what additional requirement(s) should be imposed, if any.

The proposed changes to this section would also separate and clarify the submittal requirements to FRA to obtain approval for the qualifying cant deficiency of a vehicle type (paragraph (f)) and to notify FRA prior to the implementation of the approved higher curving speeds (paragraph (g)). Additional clarification in paragraph (f) has been proposed regarding the submission of suspension maintenance information. This proposed requirement regarding the submission of suspension maintenance information would apply to vehicle types not subject to parts 238 or 229 of this chapter, such as a freight car operated in a freight train, and only to safety-critical components. Paragraph (g) would also clarify that in approving the request made pursuant to paragraph (f), FRA may impose conditions necessary for safely operating at the higher curving speeds.

FRA notes that existing footnote 3 would be redesignated as footnote 4 and modified in conformance with these proposed changes. The existing footnote reflects that this section currently allows a maximum of 4 inches of cant deficiency; hence, the static lean test requirement to raise the car on one side by 4 inches. The existing footnote also specifies a cant excess requirement of 6 inches; hence, the requirement to then alternately lower the car to the other side by 6 inches. In the proposed revisions to this section, the 4-inch limit on cant deficiency would be removed and the cant-excess requirement would be addressed in revised paragraph (b), as discussed above, for all vehicles requiring qualification under § 213.345. Thus, this footnote would refer to "the proposed cant deficiency" instead of 4 inches of cant deficiency. FRA also notes that the statement in the current footnote that the "test procedure may be conducted in a test facility" would be removed. Testing may of course be conducted in a test facility but it is not mandated, and is not necessary to continue to reference in the footnote.

Existing paragraph (e) would be moved to new paragraph (h) and revised, principally by substituting "same vehicle type" for "same class of equipment" to be consistent with the proposed use of "vehicle type" in the regulation.

Paragraph (i) would be added to reference pertinent sections of subpart G, §§ 213.333 and 213.345, that contain requirements related to operations above 5 inches of cant deficiency. These sections include requirements for periodic track geometry measurements, monitoring of carbody acceleration, and vehicle/track system qualification. Specifically, in § 213.333, FRA is proposing to add periodic inspection requirements using a Track Geometry Measurement System (TGMS) to determine compliance with § 213.53, Track gage; § 213.55(b), Track alinement; § 213.57, Curves; elevation and speed limitations; § 213.63, Track surface; and § 213.65, Combined alinement and surface deviations. In sharper curves, for which cant deficiency was high but vehicle speeds were reflective of a lower track class, it was found that stricter track geometry limits were necessary, for the same track class, in order to provide an equivalent margin of safety for operations at higher cant deficiency. FRA is also proposing to add periodic monitoring requirements for cardbody accelerations, to determine compliance with the VTI safety limits in § 213.333. Moreover, the vehicle/track system qualification requirements in § 213.345 would apply to vehicle types intended to operate at any curving speed producing more than 5 inches of cant deficiency, and include, as appropriate, a combination of computer simulations, carbody acceleration testing, truck acceleration testing, and wheel/rail force measurements. FRA believes that these proposed requirements are necessary to apply to operations at high cant deficiency on lower-speed track classes. Section 213.369(f) would also be referenced, to make clear that inspection records be kept in accordance with the requirements of § 213.333, as appropriate.

Paragraph (j) would be added to clarify that vehicle types that have been permitted by FRA to operate over track with a cant deficiency, E_u, greater than 3 inches prior to the date of publication of the final rule in the **Federal Register**, would be considered qualified under this section to operate at any such permitted cant deficiency over the previously operated track segments(s). Before the vehicle type could operate over another track segment at such a cant deficiency, the vehicle type would have to be qualified as provided in this section.

Paragraph (k) would be added as a new paragraph to define "vehicle" and "vehicle type," as used in this section. As the term "vehicle" is used elsewhere in this part and the term "vehicle type" would be significant to the application of this section, both terms would be defined here.

Section 213.63 Track Surface

Track surface is the evenness or uniformity of track in short distances measured along the tread of the rails. Under load, the track structure gradually deteriorates due to dynamic and mechanical wear effects of passing trains. Improper drainage, unstable roadbed, inadequate tamping, and deferred maintenance can create surface irregularities, which can lead to serious consequences if ignored.

The current section specifies track surface requirements and would be re-designated as paragraph (a). Paragraph (a) would generally mirror the current section but would substitute the date "June 22, 1998" for the words "prior to the promulgation of this rule" in the asterisked portion of the table. The asterisk was added in the 1998 final rule and refers to that final rule, which was promulgated on June 22, 1998; consequently, FRA is proposing that the wording be made clearer so that it refers to the 1998 final rule—not the final rule arising from this NPRM.

The primary substantive change to this section would be the addition of new paragraph (b) containing tighter, single-deviation geometry limits for operations above 5 inches of cant deficiency on curved track. These limits would include both 31-foot and 62-foot MCO limits and a new limit for the difference in crosslevel between any two points less than 10 feet apart. FRA believes that adding these track geometry limits is necessary to provide an equivalent margin of safety for operations at higher cant deficiency. These proposed limits are based on the results of simulation studies, as discussed in Section III.B. of the preamble, above, to determine the safe amplitudes of track geometry surface variations.

Section 213.65 Combined Alinement and Surface Deviations

FRA is proposing to add a new section containing limits addressing combined alinement and surface deviations that would apply only to operations above 5 inches of cant deficiency. An equation-based safety limit would be established for alinement and surface deviations occurring in combination within a single chord length of each other. The limits in this section would be used only with a TGMS and applied on the outside rail in curves.

Although the current Track Safety Standards prescribe limits on geometry variations existing in isolation, FRA recognizes that a combination of alinement and surface variations, none of which individually amounts to a deviation from the requirements in this part, may result in undesirable vehicle response. Moreover, trains operating at high cant deficiencies will increase the lateral wheel force exerted on track during curving, thereby decreasing the margin of safety associated with the VTI wheel force safety limits in § 213.333. To address these concerns, simulation studies were performed, as discussed in Section III.B. of the preamble, above, to determine the safe amplitudes of combined track geometry variations. Results show that this proposed equation-based safety limit is necessary to provide a margin of safety for vehicle operations at higher cant deficiencies.

Section 213.110 Gage Restraint Measurement Systems

This section specifies procedures for using a Gage Restraint Measuring System (GRMS) to assess the ability of track to maintain proper gage. FRA is proposing to amend this section to make it consistent with proposed changes to the GRMS requirements in § 213.333, the counterpart to this section in subpart G. Specifically, FRA is proposing to replace the Gage Widening Ratio (GWR) with the Gage Widening Projection (GWP), which would compensate for the weight of the testing vehicle. FRA believes that use of the GWP would provide at least the same level of safety and is supported by research results documented in the report titled "Development of Gage Widening Projection Parameter for the Deployable Gage Restraint Measurement System" (DOT/FRA/ORD–06/13, October 2006), which is available on FRA's Web site at *http://www.fra.dot.gov/downloads/Research/ord0613.pdf.* Moreover, by making the criteria consistent with the proposed changes to the GRMS requirements in § 213.333, a track owner or railroad would not have to modify a GRMS survey to compute a GWR for track Classes 1 through 5, and then a GWP for track Classes 6 through 9. The GWP formula would apply regardless of the class of track.

In substituting the GWP value for the GWR value, FRA is proposing to make a number of conforming changes to this section, principally to ensure that the terminology and references are consistent. These changes would be more technical than substantive, and they are neither intended to diminish nor add to the requirements of this section. In this regard, FRA notes that it is correcting the table in paragraph (l) to renumber the remedial action specified for a second level exception. The remedial action should be designated as (1), (2), and (3) in the "Remedial action required" column, consistent with how it is specified for a first level exception—not designated as footnote 2, (1), and (2), as it currently is.

FRA also notes that new footnote 5 would be added to this section, stating that "GRMS equipment using load combinations developing L/V ratios that exceed 0.8 shall be operated with caution to protect against the risk of wheel climb by the test wheelset." This footnote is identical in substance to existing footnote 7 (proposed to be redesignated to footnote 10 due to footnote renumbering), which is applicable to § 213.333, and would thus further promote conformity between this section and its subpart G counterpart.

Subpart G—Train Operations at Track Classes 6 and Higher

Section 213.305 Designation of Qualified Individuals; General Qualifications

This section recognizes that work on or about a track structure supporting high-speed train operations demands the highest awareness of employees of the need to perform their work properly. At the same time, the current wording of this section literally requires that each individual designated to perform such work know and understand the requirements of this subpart, detect deviations from those requirements, and prescribe appropriate remedial action to correct or safely compensate for those deviations, regardless whether that knowledge, understanding, and ability with regard to all of subpart G is necessary for that individual to perform his or her duties. For example, knowledge and understanding of specific vehicle qualification and testing requirements may be unnecessary for the performance of a track inspector's duties.

As a result, the Task Force recommended and FRA agrees that this rulemaking make clear that the requirements for a person to be qualified under subpart G concern those portions of this subpart necessary for the performance of that person's duties. FRA is therefore proposing to add to the end of paragraph (a)(2)(i) the words "that apply to the restoration and renewal of the track for which he or she is responsible," and to add to the end of paragraph (b)(2)(i) the words "that apply to the inspection of the track for which he or she is responsible."

This proposal would continue to require that a person designated under this section has the knowledge, understanding, and ability necessary to supervise the restoration and renewal of subpart G track, or to perform inspections of subpart G track, or both, for which he or she is responsible. At the same time, this proposal would make clear that the person would not be required to know or understand specific requirements of this subpart not necessary to the fulfillment of that person's duties. FRA does not believe that safety would be in any way diminished by this proposal. FRA believes that this proposal reflects what was intended when this section was established in the 1998 final rule.

Section 213.307 Classes of Track: Operating Speed Limits

Currently, this subpart provides for the operation of trains at progressively higher speeds up to 200 m.p.h. over four separate classes of track, Classes 6 through 9. The Task Force recommended that standards for Class 9 track be removed from this subpart and that the maximum allowable speed for Class 8 track be lowered from 160 m.p.h. to 150 m.p.h. Class 9 track was established in the 1998 final rule because of the possibility that certain operations would achieve speeds of up to 200 m.p.h. In addition, a maximum limit of 160 m.p.h. was established for Class 8 track in the 1998 final rule because trainsets had operated in this country up to that speed for periods of several months under waivers for testing and evaluation.

Although it was viewed in the 1998 final rule that standards for Class 9 track were useful benchmarks for future planning with respect to vehicle/track interaction, track structure, and inspection requirements, the Task Force noted that operations at speeds in excess of 150 m.p.h. are currently authorized by FRA only in conjunction with a rule of particular applicability (RPA) that addresses the overall safety of the operation as a system, per footnote 2 of this section. The vehicle/track interaction, track structure, and inspection requirements in an RPA would likely be specific to both the operation and system components used. Track geometry measurement systems, safety criteria, and safety limits might be quite different than currently defined. The Task Force therefore recommended that the safety of operations above 150 m.p.h. be addressed using a system safety approach and regulated through an RPA specific to the intended operation, and that the safety parameters in this subpart for general application to operations above 150 m.p.h. be removed, as a result.

Nonetheless, FRA has identified the continued need for benchmark standards addressing the highest speeds likely to be achieved by the most forward-looking, potential high-speed rail projects. As a result, FRA and the Volpe Center have conducted additional research and vehicle/track interaction simulations at higher speeds and concluded that Class 9 vehicle/track safety standards can be safely extended to include the highest contemplated speeds proposed to date—speeds of up to 220 m.p.h. FRA is including these benchmark standards in this NPRM.

FRA does intend to continue its discussions with the RSAC Task Force as any comments are addressed following the publication of this NPRM, and as noted earlier, the Task Force did not consider a comprehensive revision of all of Subpart G, including those requirements that are not distinguished by class of track. In this regard, "ballast pickup" (or flying ballast) has been subsequently identified as a potential issue for high-speed operations that may merit further consideration. Of course, FRA makes clear that the Class 9 standards would remain only as benchmark standards with the understanding that the final suitability of track safety standards for operations above 150 m.p.h. will be determined by FRA only after examination of the entire operating system, including the subject equipment, track structure, and other system attributes. Direct FRA approval is required for any such high-speed operation, whether through an RPA or another regulatory proceeding.

As a separate matter, FRA notes that the rule would require the testing and evaluation of equipment for qualification purposes at a speed of 5 m.p.h. over the maximum intended operating speed, in accordance with § 213.345, and that, for example, this would require equipment intended to operate at a maximum speed of 160 m.p.h. to be tested at 165 m.p.h. FRA therefore makes clear that operating at speeds up to 165 m.p.h. for vehicle qualification purposes under this subpart would necessarily continue, subject to the requirements for the planning and safe conduct of such test operations. These test operations are separate from general purpose operations on Class 8 track that would be limited to a maximum speed of 160 m.p.h.

In addition, FRA is proposing to slightly modify the section heading so that it reads "Classes of track: operating speed limits," using the plural form of "class." This change is intended to make the section heading conform with the heading for § 213.9, the counterpart to this section for lower-speed track classes.

Section 213.323 Track Gage

This section contains minimum and maximum limits for gage, including limits for the change in gage within any 31-foot distance. FRA is proposing to modify the limit for the change in gage within any 31-foot distance from ½ inch to ¾ inch for Class 6 track. During Task Force discussions, Amtrak raised concern that for track constructed with wood ties and cut spikes, the ½-inch variation in gage limit is difficult to maintain. Tolerance values for the rail base, tie plate shoulders, and spikes can result in a ½-inch gage variation in well-maintained track, particularly due to daily temperature fluctuations of rail and associated heat-induced stresses.

In response to Amtrak's concern, FRA conducted modeling of track with variations in gage up to ¾ inch in 31-foot distances and found no safety concerns for the equipment modeled. Modeling was also conducted using 20 miles of actual measured track geometry with these variations in gage for speeds up to 115 m.p.h. without showing safety concerns for the equipment modeled. As a result, FRA believes that modifying this limit for the change of gage for Class 6 track, with a maximum permitted speed of 110 m.p.h, would not diminish safety and would reduce the burden on the track owner or railroad to maintain safe gage.

Section 213.327 Track Alinement

FRA is proposing to change this section primarily to add tighter, single-deviation geometry limits for operations above 5 inches of cant deficiency. These would include 31-foot, 62-foot, and 124-foot MCO limits in revised paragraph (c), with the current text of paragraph (c) moving to a new paragraph (d). As discussed in Section III.B. of the preamble, above, simulation studies have been performed to determine the safe amplitudes of track geometry alinement variations. Results of these studies have shown that the track geometry limits proposed in revised paragraph (c) are necessary in order to provide a margin of safety for operations at higher cant deficiency.

In addition, the current single-deviation, track alinement limits in paragraph (b) would be revised so as to distinguish between limits for tangent and curved track. Specifically, the 62-foot MCO limit for Class 6 curved track would be narrowed to five-eighths of an inch, while the tangent track limit would remain at the existing value of three-quarters of an inch. This proposed change is intended to provide consistency between the alinement limits for track Classes 5 and 6, as the Class 5 limit for curved track in § 213.55 is five-eighths of an inch. The 62-foot MCO limits for Class 7 and Class 8 tangent track would be increased to three-quarters of an inch, while the curved track limit would remain at the existing value of one-half of an inch. The 124-foot MCO limits for Class 8 tangent track would be increased to an inch, while the curved track limit would remain at the existing value of three-quarters of an inch. These proposed changes are also based on results of the simulations studies, as discussed in section III.B. of the preamble, above.

Other changes proposed herein include adding a paragraph (e), and modifying the section heading to better conform with the format of other sections in this part. Paragraph (e) is an adaptation of footnotes 1 and 2 from § 213.55, describing the ends of the chord and the line rail. Paragraph (e) would apply to all of the requirements in this section and is consistent with current practice.

Section 213.329 Curves; Elevation and Speed Limitations

Determining the maximum speed that a vehicle may safely operate around a curve is based on the degree of track curvature, actual elevation, and amount of unbalanced elevation, where the actual elevation and curvature are derived by a moving average technique. This approach, as codified in this section, is as valid in the high-speed regime as it is in the lower-speed track classes, and § 213.57 is the counterpart to this section for track Classes 1 through 5. FRA is proposing to revise this section, in particular to modify and clarify the qualification requirements and approval process for vehicles intended to operate at more than 3 inches of cant deficiency.

Paragraph (a) currently provides that the maximum crosslevel on the outside rail of a curve may not be more than 7 inches. This requirement would be restated to provide that the maximum elevation of the outside rail of a curve may not be more than 7 inches. Crosslevel is a function of elevation differences between two rails, and is the focus of other provisions of this proposal, specifically § 213.331, Track surface. The proposed clarification here is intended to limit the elevation of a single rail.

FRA notes that the Task Force recommended moving to § 213.331 the second requirement of paragraph (a), which provides that "[t]he outside rail of a curve may not be more than ½ inch lower than the inside rail." Instead, FRA has decided that this requirement should be re-written more clearly to restrict configuring track so that the outside rail of a curve is designed to be lower than the inside rail, while allowing for a deviation of up to one-half of an inch as provided in § 213.331, which now includes a proposal for a limit for reverse crosslevel deviation. This requirement in paragraph (a) is intended to restrict configuring track so that the outside rail of a curve is designed to be lower than the inside rail; the limits at issue in § 213.331 govern local deviations from uniform elevation—from the designed elevation—that occur as a result of changes in conditions. Rather than conflict, these provisions complement each other, addressing both the designed layout of a curve and deviations from that layout that result from actual use and wear.

Paragraph (b) has been added to address potential vehicle rollover and passenger safety issues should a vehicle be stopped or traveling at very low speed on superelevated curves. For this cant-excess condition the rule would require that all vehicles requiring qualification under § 213.345 must demonstrate that when stopped on a curve having a maximum uniform elevation of 7 inches, no wheel unloads to a value less than 50 percent of its static weight on level track. This proposed requirement would include an allowance for side-wind loading on the vehicle to prevent complete unloading of the wheels on the high (elevated) rail and incipient rollover.

Paragraph (c) would continue to specify the V_{max} equation that sets the maximum allowable curving speed based on the qualified cant deficiency, E_u, for a vehicle type. New footnote 7 is proposed to be added to allow the vehicle to operate at the qualified cant deficiency for which it is approved, E_u, plus one-half of an inch, if actual elevation of the outside rail, E_a, and degree of track curvature, D, change as a result of track degradation. This one-half-inch margin would provide a tolerance to account for the effects of local crosslevel or curvature conditions on V_{max} that may result in the operating cant deficiency exceeding that approved for the equipment. Without this tolerance, these conditions could generate a limiting speed exception and some railroads have adopted the approach of reducing the operating cant deficiency of the vehicle in order to avoid these exceptions.

Existing footnote 4 would be redesignated as footnote 6, and a statement within the existing footnote would be removed regarding the application of the V_{max} equation to the spirals on both ends of the curve if E_u exceeds 4 inches. The V_{max} equation is intended to be applied in the body of the curve where the cant deficiency will be the greatest and the actual elevation and degree of curvature are determined according to the moving average techniques defined in the footnotes. Within spirals, where the degree of curvature and elevation are changing continuously, local deviations from uniform elevation and degree of curvature are governed by the limits in § 213.327 and § 213.331.

Existing footnote 5 would be redesignated as footnote 8 without substantive change.

Paragraph (d) would be revised to provide that all vehicle types are considered qualified for up to 3 inches of cant deficiency, as allowed by the current rule.

Paragraph (e) currently specifies two static lean test requirements for vehicle qualification for more than 3 inches of cant deficiency. When a vehicle is standing on superelevation equal to the proposed cant deficiency, the first requirement limits the vertical wheel load remaining on the raised wheels to no less than 60% of their static level values and the roll of a passenger carbody to 5.7 degrees with respect to the horizontal. The second, existing requirement addresses potential roll-over and passenger safety issues should a vehicle be stopped or traveling at very low speed on superelevated curves, by limiting the vertical wheel load remaining on the raised wheels to no less than 60% of their static level values and the roll of a passenger carbody to 8.6 degrees with respect to the horizontal. The latter requirement is intended to be addressed in paragraph (b), as discussed above, for all vehicles requiring qualification under § 213.345.

The proposed requirements in paragraph (e) could be met by either static or dynamic testing and are related to the proposed changes to the requirements in § 213.57. As proposed to be revised, the static lean test would limit the vertical wheel load remaining on the raised wheels to no less than 60% of their static level values and the roll of a passenger carbody to 8.6 degrees with respect to the horizontal, when the vehicle is standing on track with superelevation equal to the intended cant deficiency. The dynamic test would limit the steady-state vertical wheel load remaining on the low rail wheels to no less than 60% of their static level values and the lateral acceleration in a passenger car to 0.15g steady-state, when the vehicle operates through a curve at the intended cant deficiency. This 0.15g steady-state lateral acceleration limit in the dynamic test would provide consistency with the 8.6-degree roll limit in the static lean test, in that it corresponds to the lateral acceleration a passenger would experience in a standing (stationary) vehicle whose carbody is at a roll angle of 8.6 degrees with respect to the horizontal. The 5.7-degree roll limit, which limits steady-state, carbody lateral acceleration to 0.1g, would be eliminated from the existing rule.

The discussion of proposed § 213.57(e) should be read in connection with the requirements proposed in this paragraph. FRA refers commenters to that discussion and is generally not repeating it here. As noted, the less stringent steady-state, carbody lateral acceleration limit and carbody roll angle limit proposed in this rule would reduce the need to equip vehicles with tilt systems at higher cant deficiencies—and seemingly the costs associated with such features, as well. Moreover, by facilitating higher cant deficiency operations, savings could also result from shortened trip times. These savings could be particularly beneficial to passenger operations in emerging high-speed rail corridors, enabling faster operations through curves.

Of course, any such savings should not come at the expense of safety, and FRA is proposing additional track geometry requirements for operations above 5 inches of cant deficiency, whether or not the vehicles are equipped with tilt systems. These additional track geometry requirements were developed to control for undesirable vehicle response to track conditions that could pose derailment concerns. They may also help to control in some way for transient, carbody acceleration events that could pose ride safety concerns for passengers subjected to higher steady-state, carbody lateral acceleration levels, but they were not specifically developed to address such concerns and their effect has not been modeled. These additional track geometry requirements are being proposed to apply only to operations above 5 inches of cant deficiency, where steady-state, carbody lateral acceleration would approach 0.15g for typical vehicle designs. FRA does note that higher cant deficiencies are necessary to support high-speed operations on curved track, and, as a result, the additional track geometry requirements proposed in the NPRM for such high cant deficiency operations would likely be implicated.

FRA is not aware of any general passenger safety issue involving passengers losing their balance and falling due to excessive steady-state, carbody lateral accelerations in current operations. Yet, as noted in the discussion of § 213.57(e), FRA is concerned in particular about the effect transient, carbody lateral acceleration events that pose no derailment safety concerns may nonetheless have on passenger ride safety when combined with increased steady-state, carbody lateral acceleration forces. Consequently, to fully inform FRA's decisions in preparing the final rule arising from this NPRM, FRA is specifically inviting public comment on the proposal to set the steady-state, carbody lateral acceleration limit at 0.15g. FRA requests specific comment on whether the proposed rule appropriately provides for passenger ride safety, and if not, requests that the commenters state what additional requirement(s) should be imposed, if any.

The proposed changes also separate and clarify the submittal requirements to FRA to obtain approval for the qualifying cant deficiency of a vehicle type (paragraph (f)) and to notify FRA prior to the implementation of the approved higher curving speeds (paragraph (g)). Additional clarification has been proposed regarding the submission of suspension maintenance information. This proposed requirement regarding the submission of suspension maintenance information would apply to vehicle types not subject to part 238 or part 229 of this chapter, and only to safety-critical components. Paragraph (g) would also make clear that in approving the request made pursuant to paragraph (f), FRA may impose conditions necessary for safely operating at the higher curving speeds.

FRA notes that existing footnote 6 would be redesignated as footnote 9 and modified in conformance with the proposed changes. The existing footnote offers an example test procedure that provides measurements for up to 6 inches of cant deficiency and 7 inches of cant excess. This footnote would be modified for the general condition of "the proposed cant deficiency" rather than a specific example, and the cant excess requirement would be addressed through paragraph (b). FRA also notes that the statement in the current footnote that the "test procedure may be conducted in a test facility" would be removed. Testing may of course be conducted in a test facility but it is not mandated, and is not necessary to continue to reference in the footnote.

The requirements of existing paragraph (f) would be moved to paragraph (h) and revised, principally by substituting "same vehicle type" for "same class of equipment" to be consistent with the proposed use of "vehicle type" in the regulation.

Paragraph (i) is proposed to be added to clarify that vehicle types that have been permitted by FRA to operate at a cant deficiency, E_u, greater than 3 inches prior to [DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER], would be considered qualified under this section to operate at any such permitted cant deficiency over the previously operated track segments(s). Before the vehicle type could operate over another track segment at such cant deficiency, the vehicle type would have to be qualified as provided in this section.

Paragraph (j) would be a new paragraph for defining "vehicle" and "vehicle type," as used in this section and in §§ 213.333 and 213.345. These terms would have the same meaning as in proposed § 213.57(k) and are being defined here so that they would apply to the appropriate sections of subpart G.

Section 213.331 Track Surface

This section is the counterpart to § 213.63 and is intended for higher-speed track classes.

Three changes have been proposed to the existing single-deviation, track surface limits in paragraph (a). Specifically, the 124-foot MCO limit for Class 9 track would be reduced to 1 inch. This proposed change is based on a review of simulation results of Acela equipment. Further, the limit for the difference in crosslevel between any two points less than 62 feet apart would be reduced to 1¼ inch for Class 8 track, and 1 inch for Class 9 track. These proposed changes are intended to provide consistent safety limits based on the results of simulation studies conducted for short warp conditions.

In addition, three new limits are proposed to be added to the existing single-deviation, track surface limits in paragraph (a). Two of these limits (deviation from zero crosslevel on tangent track, and reverse elevation for curved track), although not explicitly stated in the current table, are applicable to track Classes 6 through 9 because these higher track classes must meet at least the minimum geometry requirements for track Classes 1 through 5. These two limits would be expressly added in order to make this section comprehensive. Specifically, the existing 1-inch limit for deviation from zero crosslevel on tangent Class 5 track, as specified in § 213.63, would be added for track Classes 6 through 9. Second, the ½-inch reverse elevation limit for curved track, as currently specified in § 213.329(a), would be moved to this section. The third limit, a new limit for the difference in crosslevel between any two points less than 10 feet apart (short warp), would be added to paragraph (a). It should be noted that the Task Force proposed that the existing 1-inch runoff limit for Class 5 track, as specified in § 213.63, be added for higher track classes. However, FRA believes that appropriate surface requirements have already been established in § 213.331 that address this issue and thus has not included this limit in the proposed rule.

FRA is proposing to add tighter geometry limits for operations above 5 inches of cant deficiency in revised paragraph (b). These would include 124-foot MCO limits and a new limit for the difference in crosslevel between any two points less than 10-feet apart (short warp). The text of existing paragraph (b) would be moved to new paragraph (c). As discussed in Section III.B. of the preamble, above, simulation studies have been performed to determine the safe amplitudes of surface track geometry variations. Results show that the proposed track geometry limits proposed in revised paragraph (b) are necessary in order to provide an equivalent margin of safety for operations at higher cant deficiency.

Section 213.332 Combined Alinement and Surface Deviations

FRA is proposing to add a new section containing limits addressing combined alinement and surface deviations that would apply only to high-speed operations above 5 inches of cant deficiency, as well as any operation at Class 9 speeds. An equation-based safety limit would be established for alinement and surface deviations occurring in combination within a single chord length of each other. The limits in this section would be used only with a TGMS. They would be applied on the outside rail in curves, and for Class 9 track operations would be applied on the outside rail in curves as well as to any of the two rails of a tangent section.

See the discussion of § 213.65, which is the companion provision to this section for lower-speed classes of track.

Section 213.333 Automated Vehicle Inspection Systems

FRA is proposing many significant changes to this section, which contains requirements for automated measurement systems—namely, track geometry measurement systems, gage restraint measurement systems, and the systems necessary to monitor vehicle/track interaction (acceleration and wheel/rail forces).

In paragraph (a), FRA is proposing to add TGMS inspection requirements for low-speed, high cant deficiency operations, which would apply as required by § 213.57(i). As previously noted, FRA believes that these requirements are appropriate and necessary for operations at high cant deficiency on lower-speed track classes. FRA is also proposing to add TGMS inspection requirements for Class 6 track. For Class 7 track, FRA is proposing to reduce slightly the minimum period between required TGMS inspections. The current Class 7 track inspection frequency of twice within 120 calendar days with not less than 30 days between inspections would be reduced to not less than 25 days between inspections so that more frequent inspections could be performed, for example, monthly. This would provide the railroad additional flexibility for operational reasons to comply in the event of incomplete inspections. The proposed frequency would require that the time interval between any two successive inspections be not less than 25 calendar days and not more than 95 calendar days. The current Class 8 and 9 track TGMS inspection frequency of twice within 60 calendar days with not less than 15 days between inspections would be reduced to not less than 12 days between inspections so that more frequent inspections could be performed, for example, bi-weekly. This would also provide the railroad additional flexibility for operational reasons to comply in the event of incomplete inspections. The proposed frequency would require that the time interval between any two successive inspections be not less than 12 calendar days and not more than 48 calendar days.

In paragraph (b), FRA is proposing to amend the TGMS sampling interval to not exceed 1 foot. This requirement is in line with current practices to provide sufficient data to identify track geometry perturbations.

In paragraph (c), FRA is proposing to specify the application of the added TGMS inspection requirements for high cant deficiency operations on lower-speed track classes. These requirements in subpart G would apply to vehicle types intended to operate at any curving speed producing more than 5 inches of cant deficiency, as provided in § 213.57(i). Existing requirements for track Classes 6 through 9 would be amended to reference § 213.332, the newly proposed section for combined alinement and surface defects.

Paragraphs (d) through (g) would remain unchanged.

As noted in the discussion of § 213.110, FRA is also proposing changes to the GRMS testing requirements in paragraphs (h) and (i), to reflect recommendations made in the FRA report titled "Development of Gage Widening Projection Parameter for the Deployable Gage Restraint Measurement System," *see* above. These changes include replacing the GWR equation (and all references to GWR) with a GWP equation, which would compensate for the weight of the testing vehicle. This correction would result in more uniform strength measurements across the variety of testing vehicles that are in operation. FRA is also proposing that the Class 8 and 9 track inspection frequency of once per year with not less than 180 days between inspections be rewritten to require at least one inspection per calendar year with not less than 170 days between inspections, to allow some additional flexibility in scheduling inspections. The proposed frequency would require that the time interval between any two successive inspections would not be less than 170 days and not more than 730 days.

FRA is proposing to revise the wording and requirements in paragraphs (j) and (k), which relate to carbody and truck accelerometer monitoring. Proposed changes include adding the option to use a portable device when performing the acceleration monitoring and clarifying where the carbody and truck accelerometers would be located. Monitoring requirements would be added for operations above 5 inches of cant deficiency on track Classes 1 through 6, in order to provide for the safety of these operations. These proposed requirements for monitoring high cant deficiency operations would apply to vehicle types qualified to operate at any curving speed producing more than 5 inches of cant deficiency, as provided in §§ 213.57(i) and § 213.345(a), as appropriate. The monitoring requirements and qualification requirements in the rule for carbody and truck accelerations would thereby continue to work together, as the current monitoring requirements for track Classes 7 through 9 are likewise intended to apply to vehicles that have been qualified to operate under § 213.345.

As discussed in Section III.A. of the preamble, FRA is proposing to revise the requirement in existing paragraph (j) to monitor carbody and truck accelerations each day on at least one vehicle in one train operating at track Class 8 and 9 speeds. Based on data collected to date and to reduce unnecessary burden on the track owner or railroad operating the vehicle type, this monitoring frequency would be reduced from once per day to at least four times per week for carbody accelerations, and twice within 60 days for truck accelerations. In addition, a clause would be added to revised paragraph (k) to allow the track owner or operating railroad to petition FRA, after a specified amount of time or mileage, to eliminate the periodic vehicle track interaction truck accelerometer monitoring requirement for Class 8 and 9 track. Nonetheless, FRA notes that in addition to these requirements, pursuant to § 238.427, truck acceleration is continuously monitored on each Tier II vehicle in order to determine if hunting oscillations of the vehicle are occurring during revenue operation.

FRA is proposing to modify the current requirement in paragraph (l) for conducting instrumented wheelset (IWS) testing on Class 8 and 9 track so that IWS testing would no longer be a general requirement applicable for all Class 8 and 9 track. Instead, the specific necessity to perform this testing would be determined by FRA on a case-by-case basis, after performing a review of a report annually submitted to it detailing the accelerometer monitoring data collected in accordance with paragraphs (j) and (k) of this section. A thorough review of the Acela trainset IWS data, as well as consideration of the economics associated with the testing, revealed that there was significant cost and little apparent safety benefit to justify IWS testing as a general requirement on an annual basis. FRA believes that the testing and monitoring requirements in this section, as a whole, that would be generally required, together with FRA's oversight and ability to impose IWS testing requirements as needed, would be sufficient to maintain safety at a lower cost.

FRA is proposing to make conforming changes to paragraph (m), which currently requires that the track owner maintain a copy of the most recent exception printouts for the inspections required under current paragraphs (k) and (l) of this section. Because of the proposed revisions to this section, paragraph (m) would reference the inspections required under paragraphs (j) and (k) of this section, and paragraph (l), as appropriate, should IWS testing be required. FRA notes that the Task Force did not specifically propose to retain paragraph (m), seemingly because of the proposed addition in paragraph (l) of an annual requirement to provide an analysis of the monitoring data gathered for operations on track Classes 8 and 9. However, while this proposed reporting requirement in paragraph (l) would be new, it is intended to support amending the IWS testing requirements so that IWS testing would no longer be generally required for Class 8 and 9 operations, as discussed above. Moreover, the reporting requirement is only an annual one and, by virtue of applying only to Class 8 and 9 operations, would not address lower-speed operations. In addition, the Task Force did not specifically propose to amend § 213.369(f), which provides that each vehicle/track interaction safety record required under §§ 213.333(g) and (m) be made available for inspection and copying by FRA at a specified location. In fact, the Task Force did recommend referencing § 213.369(f) for lower-speed, high cant deficiency operations, as proposed in § 213.57(i). Overall, FRA believes that it was an oversight for the Task Force not to propose retaining paragraph (m) and that it is both good practice and essential for FRA oversight to continue keeping the most recent records of exceptions as provided in paragraph (m). FRA is therefore proposing to retain paragraph (m), as modified.

Substantial changes are proposed to be made to the content of the Vehicle/Track Interaction Safety Limits Table (VTI Table). In general, the "Requirements" for most of the limits are proposed to be clarified or updated. Specifically, the Single Wheel Vertical Load Ratio limit would be tightened from 0.10 to 0.15 to ensure an adequate safety margin for wheel unloading.

The Net Axle Lateral L/V Ratio limit would be modified from 0.5, to 0.4 + 5.0/V_a, so as to take into account the effect of axle load and would more appropriately reflect the cumulative, detrimental effect of track panel shift from heavier vehicles. This net axle lateral load limit is intended to control excessive lateral track shift and is sensitive to a number of track parameters. The well-established, European Prud'homme limit is a function of the axle load and this sensitivity was desired to differentiate between coach car and heavier locomotive loads. The Volpe Center's Treda (Track REsidual Deflection Analysis) simulation work, testing at TTCI, and comparison to the Prud'homme limit all indicated the dependence on axle load and the importance of initial small lateral deflections. Representatives of the Task Force independently reviewed the Volpe Center analysis and concurred with the proposed change. The limiting condition would allow for a small initial deformation and assumes a stable configuration with the accumulation of additional traffic.

Due to variations in vehicle design requirements and passenger ride safety, the carbody acceleration limits are proposed to be divided into separate limits for "Passenger Cars" and those for "Other Vehicles" (such as conventional locomotives). In addition, the carbody transient acceleration limits are proposed to be modified from 0.5g lateral and 0.6g vertical, to 0.65g for passenger cars and 0.75g for other vehicles in the lateral direction and 1.0g for both passenger cars and other vehicles in the vertical direction. These changes were proposed after considerable research into the performance of existing vehicles during qualification testing and revenue operations. Overall, it was found that the existing carbody transient acceleration limits need not be as stringent to protect against events leading to vehicle or passenger safety issues.

Based on the small energy content associated with high-frequency acceleration events of the carbody, FRA is proposing to add text to exclude any transient acceleration peaks lasting less than 50 milliseconds. Other changes proposed include the addition of new limits for sustained carbody lateral and vertical oscillatory accelerations, as well as the addition of minimum requirements for sampling and filtering of the acceleration data. The sustained carbody oscillatory acceleration limits have been proposed in response to a review of data that was obtained during qualification testing for the MARC–III multi-level passenger car, as discussed in Section III.A. of the preamble. The sustained carbody oscillatory acceleration limits are proposed to be 0.10g RMSt for passenger cars and 0.12g RMSt for other vehicles in the lateral direction, and 0.25g RMSt for both passenger cars and other vehicles in the vertical direction. These new limits would require that the RMSt (root mean squared with linear trend removed) value be used in order to attenuate the effects of the linear variation in oscillatory accelerations resulting from negotiation of track segments with changes in curvature or grade by design, such as spirals. Root mean squared values would be determined over a sliding 4-second window with linear trend removed and be sustained for more than 4 seconds. Acceleration measurements would be processed through a low pass filter with a minimum cut-off frequency of 10 Hz and the sample rate for oscillatory acceleration data would be at least 100 samples per second.

The last set of proposed changes to the VTI Table concern the truck lateral acceleration limit used for the detection of truck hunting. This limit would be tightened from 0.4g to 0.3g and would specify that the value must exceed that limit for more than 2 seconds. Analyses conducted by FRA have shown that this would help to better identify the occurrences of excessive truck hunting, while excluding high-frequency, low-amplitude oscillations that would not require immediate attention. In addition, the revised limit would require that the RMS_t value be used rather than the RMS_m (root mean squared with mean removed) value. FRA believes this proposed change would improve the process for analyzing data while the vehicle is negotiating spiral track segments.

Section 213.345 Vehicle/Track System Qualification

As part of the 1998 Track Safety Standards final rule, all rolling stock (both passenger and freight) was required to be qualified for operation for its intended track class. However, this section "grandfathered" equipment that had already operated in specified track classes. Rolling stock operating in Class 6 track within one year prior to the promulgation of the 1998 final rule was considered qualified. Further, vehicles operating at Class 7 track speeds under conditional waivers prior to the promulgation of the 1998 rule were qualified for Class 7 track, including equipment that was then-operating on the Northeast Corridor at Class 7 track speeds. For equipment not "grandfathered," qualification testing was intended to ensure that the equipment not exceed the VTI Table limits specified in § 213.333 at any speed less than 10 m.p.h. above the proposed maximum operating speed.

FRA is proposing a number of significant changes to this section, whose heading would be modified from "Vehicle qualification testing" to "Vehicle/track system qualification" to more appropriately reflect the interaction of the vehicle and the track over which it operates as a system. These changes include modifying and clarifying this section's substantive requirements, reorganizing the structure and layout of the rule text, and revising the qualification procedures. Among the changes proposed, lower-speed, high cant deficiency operations would be subject to this section in accordance with § 213.57(i).

Paragraph (a), as proposed to be revised, would require all vehicle types intended to operate at Class 6 speeds or above or at any curving speed producing more than 5 inches of cant deficiency to be qualified for operation for their intended track classes in accordance with this subpart. For qualification purposes, the current over-speed testing requirement would be reduced from 10 m.p.h. to 5 m.p.h. above the maximum proposed operating speed. FRA agrees with the Task Force's view that the existing 10 m.p.h. over-speed testing requirement, which was established as part of the 1998 final rule, is overly conservative based on improved speed control and display technology deployed in current operations.

Paragraph (b) would address qualification of existing vehicle types and make clear that grandfathered equipment would be considered qualified to operate over previously-operated track segment(s) only. Grandfathered equipment would not be qualified to operate over new routes (even at the same track speeds) without meeting the requirements of this section.

Paragraph (c) would contain the requirements for new vehicle qualification. The additional (and tighter) carbody acceleration limits in current paragraph (b) for new vehicle qualification are proposed to be removed. In their place, this section would refer to § 213.333 for the applicable VTI limits for accelerations and wheel/rail forces. This change was proposed after considerable research into the performance of existing vehicles during qualification testing and revenue operations. Overall, it was found that the acceleration limits in current paragraph (b) need not be as stringent to protect against events leading to vehicle or passenger safety issues.

For new vehicles intending to operate at track Class 6 speeds or above, or at any curving speed producing more than 5 inches of cant deficiency, the qualification requirements would include, as appropriate, a combination of computer simulations, carbody acceleration testing, truck acceleration testing, and wheel/rail force measurements. Computer simulations would be required for all operations at track Class 6 through Class 9 speeds or for any operations above 6 inches of cant deficiency. These simulations would be conducted on both an analytically defined track segment representative of minimally compliant track conditions (MCAT) for the respective track classes as specified in appendix D to this part and on a track segment representative of the full route on which the vehicle type is intended to operate. (*See* the discussion of MCAT in appendix D, below.) Carbody acceleration testing would be required for all operations at track Class 6 speeds or above, or for any operations above 5 inches of cant deficiency. Truck acceleration testing would be required for all operations at track Class 6 speeds or above. Wheel/rail force measurements, through the use of instrumented wheelsets (or equivalent devices), would be required for all operations at track Class 7 speeds or above, or for any operations above 6 inches of cant deficiency.

In paragraph (d), FRA is proposing to add a qualification requirement for previously qualified vehicles intended to operate on new track segments. This requirement would ensure that when qualified vehicles currently in operation are intended to operate on a new route, the new vehicle/track system is adequately examined for deficiencies prior to revenue service operation. For previously qualified vehicles intending to operate on new routes at track Class 6 through Class 9 speeds and at cant deficiencies greater than 4 inches, or at any curving speed producing more than 5 inches of cant deficiency, the qualification requirements would also include, as appropriate, a combination of computer simulations, carbody acceleration testing, truck acceleration testing, and wheel/rail force measurements. Specifically, for all operations at track Class 7 speeds or above, or for any operations above 6 inches of cant deficiency, either computer simulations or measurement of wheel/rail forces would be required. For track Classes 6 through 9, carbody acceleration testing would be required for all operations above 4 inches of cant deficiency. Carbody acceleration testing would also be required for any operations above 5 inches of cant deficiency. For all operations at track Class 7 through Class 9 speeds, truck acceleration testing would be required.

Paragraph (e) would clarify the current requirements in existing paragraph (c) for the content of the qualification test plan and would add a requirement for the plan to be submitted to FRA at least 60 days prior to conducting the testing.

Paragraph (f) would contain the requirements for conducting qualification testing, expanding on the current requirements in this section. For instance, this paragraph would expressly require that a TGMS vehicle be operated over the intended test route within 30 days prior to the start of the testing. This paragraph would also make clear that any exceptions to the safety limits that occur on track or at speeds that are not part of the test do not need to be reported. For example, any exception to the safety limits that would occur at speeds below track Class 6 speeds when the cant deficiency is at or below 5 inches would not need to be reported.

Paragraph (g) contains the requirements for reporting to FRA the results of the qualification program. Pursuant to paragraph (h), FRA would approve a maximum train speed and value of cant deficiency for revenue service, based on the test results and submissions. Paragraph (h) would also make clear that FRA may impose conditions necessary for safely operating at the maximum train speed and value of cant deficiency approved for revenue service.

Section 213.355 Frog Guard Rails and Guard Faces; Gage

This section currently sets limits for guard check and guard face gage for track Classes 6 through 9. FRA is proposing to make minor changes to the way in which the requirements of this section are formatted. However, no substantive change is intended.

Appendix A to Part 213—Maximum Allowable Curving Speeds

This appendix currently contains two charts showing maximum allowable operating speeds in curves, by degree of curvature and inches of unbalance (cant deficiency). Table 1 applies to curves with 3 inches of unbalance; Table 2 to curves with 4 inches of unbalance. Because FRA is proposing to increase allowable cant deficiencies, this appendix would be expanded to include two additional tables, Tables 3 and 4, which would apply, respectively, to curves with 5 and 6 inches of unbalance. While this rule does provide for operations at higher levels of unbalance, for convenience FRA is including those additional tables that it believes would be helpful for more common use.

Appendix B to Part 213—Schedule of Civil Penalties

Appendix B to part 213 contains a schedule of civil penalties for use in connection with this part. FRA intends to revise the schedule of civil penalties in issuing the final rule to reflect revisions made to part 213. Because such penalty schedules are statements of agency policy, notice and comment are not required prior to their issuance. *See* 5 U.S.C. 553(b)(3)(A). Nevertheless, commenters are invited to submit suggestions to FRA describing the types of actions or omissions for each proposed regulatory section, either added or revised, that would subject a person to the assessment of a civil penalty. Commenters are also invited to recommend what penalties may be appropriate, based upon the relative seriousness of each type of violation.

Appendix D to Part 213—Minimally Compliant Analytical Track (MCAT) Simulations Used for Qualifying Vehicles To Operate at High Speeds and at High Cant Deficiencies

The Track Safety Standards require that vehicles demonstrate safe operation for various track conditions. Computational models have become practical and reliable tools for understanding the dynamic interaction of vehicles and track, as a result of advancements made over the last few decades. Consequently, portions of the qualification requirements in subpart G could effectively be met by simulating vehicle testing using a suitably-validated vehicle model instead of testing an actual vehicle over a representative track segment. Such models are capable of assessing the response of vehicle designs to a wide range of track conditions corresponding to the limiting conditions allowed for each class of track.

Appendix D would be a new appendix containing requirements for the use of computer simulations to comply with the vehicle/track system qualification testing requirements specified in subpart G of this part. These simulations would be performed using a track model containing defined geometry perturbations at the limits that are permitted for a class of track and level of cant deficiency. This track model is referred to as MCAT. These simulations would be used to identify vehicle dynamic performance issues prior to service, and demonstrate that a vehicle type is suitable for operation on the track over which it would operate.

In order to validate a computer model using MCAT, the predicted results must be compared to actual data from on-track, instrumented vehicle performance testing using accelerometers, or other instrumentation, or both. Validation must also demonstrate that the model is sufficiently robust to capture fundamental responses observed during field testing. Disagreements between predictions and test data may be indicative of inaccurate vehicle parameters, such as stiffness and damping, or track input. Once validated, the computer model can be used for assessment of a range of operating conditions or even to examine modifications to current designs.

FRA notes that the length of each MCAT segment in this appendix is the same segment length that was used in the modeling of several representative high-speed vehicles. *See* the discussion of computer modeling in section III.B. of this NPRM, above, for additional background.

Proposed Amendments to 49 CFR Part 238, Passenger Equipment Safety Standards

Subpart C—Specific Requirements for Tier I Passenger Equipment

Section 238.227 Suspension System

FRA is proposing to modify this section to conform with the changes being proposed to part 213 of this chapter and also to provide cross-references to relevant sections of part 213. Overall, these proposed revisions would help to reconcile the requirements of the 1998 Track Safety Standards final rule and the 1999 Passenger Equipment Safety Standards final rule for Tier I passenger equipment.

For consistency throughout this part and part 213 of this chapter, the term "hunting oscillations" in paragraph (a) would be replaced with the term "truck hunting," which would have the same meaning as that for "truck hunting" in 49 CFR 213.333. Truck hunting would be defined in § 213.333 as "a sustained cyclic oscillation of the truck evidenced by lateral accelerations exceeding 0.3g root mean squared for more than 2 seconds." The Task Force believed that the current term "hunting oscillations," defined as "lateral oscillations of trucks that could lead to a dangerous instability," has a less definite meaning and could be applied unevenly as a result. The Task Force therefore preferred using the definition of "truck hunting" with its more specific criteria, and FRA agrees that more specific criteria would provide more certainty. Unlike § 213.333, however, paragraph (a) of this section would apply to all Tier I passenger equipment, regardless of track class or level of cant deficiency.

The existing pre-revenue service qualification requirements in paragraph (b) are proposed to be revised consistent with the proposed revisions to part 213 of this chapter. Paragraph (b) would also be broadened to address revenue service operation requirements. Paragraph (b), as proposed to be revised, would in effect generally summarize the qualification and revenue service operation requirements of part 213 for Tier I passenger equipment. This proposed paragraph is not intended to impose any requirement itself not otherwise contained in part 213.

Subpart E—Specific Requirements for Tier II Passenger Equipment

Section 238.427 Suspension System

Similar to the revisions proposed for § 238.227, FRA is proposing to modify this section to conform to the changes being proposed in part 213 of this chapter. Overall, these proposed revisions would help to reconcile the requirements of the 1998 Track Safety Standards final rule and the 1999 Passenger Equipment Safety Standards final rule.

While paragraph (a)(1) would remain unchanged, paragraph (a)(2) would be revised in an effort to summarize the qualification and revenue service operation requirements of part 213 for Tier II passenger equipment. The reference to the suspension system safety standards in appendix C would be removed, as discussed below. The existing carbody acceleration requirements in paragraph (b) would be revised consistent with the proposed changes to part 213. The current steady-state lateral carbody acceleration limits of 0.1g for pre-revenue service qualification and 0.12g for service operation are proposed to be revised to a single limit of 0.15g, to conform to the proposed requirements in § 213.329. Please *see* the discussion of § 213.329. The remaining carbody acceleration requirements would be consolidated by referencing the requirements of § 213.333.

Similar to the proposed revision of § 238.227, the term "truck hunting" in paragraph (c) would have the same meaning as that proposed for "truck hunting" in § 213.333.

The Task Force believed that the overheat sensor requirements in existing paragraph (d) are not directly related to suspension system safety and should be specified elsewhere. FRA agrees that the requirements of this paragraph can be stated separately for clarity, and is therefore proposing to move them to a new section, § 238.428.

Section 238.428 Overheat Sensors

FRA is proposing to add a new section containing the requirements currently found in § 238.427(d). No change to the current rule text is proposed, however. FRA agreed with the Task Force that the requirements for overheat sensors would be more appropriately contained in their own section rather than with the requirements for suspension systems in § 238.427.

Appendix A to Part 238—Schedule of Civil Penalties

Appendix A to part 238 contains a schedule of civil penalties for use in connection with this part. FRA intends to revise the schedule of civil penalties in issuing the final rule to reflect revisions made to part 238. Because such penalty schedules are statements of agency policy, notice and comment are not required prior to their issuance. *See* 5 U.S.C. 553(b)(3)(A). Nevertheless, commenters are invited to submit suggestions to FRA describing the types of actions or omissions for each proposed regulatory section that would subject a person to the assessment of a civil penalty. Commenters are also invited to recommend what penalties may be appropriate, based upon the relative seriousness of each type of violation.

Appendix C to Part 238—Suspension System Safety Performance Standards

FRA is proposing to remove and reserve appendix C, which currently includes the minimum suspension system safety performance standards for Tier II passenger equipment. FRA believes that removing appendix C is appropriate in light of the proposal to amend § 238.427(a)(2). Currently, § 238.427(a)(2) requires that Tier II passenger equipment meet the safety performance standards for suspension systems contained in appendix C, or alternative standards providing at least equivalent safety if approved by FRA under § 238.21. As discussed above, FRA is proposing to revise § 238.427(a)(2) to require compliance with the safety standards contained in § 213.333, instead of those in this appendix C. Given the proposal to cross-reference the requirements in § 213.333, which are more extensive than the ones contained in this appendix C, appendix C would no longer be necessary and would therefore be removed and reserved.

V. Regulatory Impact and Notices

A. Executive Order 12866 and DOT Regulatory Policies and Procedures

This proposed rule has been evaluated in accordance with existing policies and procedures and determined to be non-significant under both Executive Order 12866 and DOT policies and procedures. *See* 44 FR 11034; February 26, 1979. FRA has analyzed the costs and benefits of this proposed rule. FRA believes that the cost savings would offset any new cost burden. Even if that were not the case, FRA is confident that the benefits and the cost savings, taken together, would exceed any additional cost burden. As noted above, the Task Force developed proposals intended to result in improved public safety while reducing the burden on the railroad industry where possible.

Below is an analysis of four main things that the proposed rulemaking would accomplish:

1. The rulemaking would revise the current regulation in subpart G of part 213, which has performance standards and specifications for track geometry for track Classes 6 and higher, and which offers affected railroads and car manufacturers the ability to arrive at a mutually-beneficial set of car dynamics and track engineering standards. In practice, the one impacted railroad, Amtrak, has asked manufacturers to build equipment that will meet the performance standards at the maximum deviations permitted under the geometric standards, as opposed to geometric parameters that would permit current high-speed passenger equipment to meet the acceleration and other performance requirements. Manufacturers state that this has proved unworkable because they cannot build equipment economically that can meet the acceleration and other performance standards when the track is at the maximum permissible deviations, using technology in production today. Overall, FRA has reviewed the performance standards in light of advanced simulations that were developed to support the rulemaking effort, as discussed in Section III of the preamble, and has proposed to refine those standards to better focus on identified safety concerns and remove any unnecessary costs.

2. The rulemaking would add flexibility through procedures for safely permitting high cant deficiency operations on track Classes 1 through 5, without the need for obtaining a waiver. In order to take advantage of higher cant deficiency operations, a railroad would have to qualify the equipment and maintain the track to more stringent standards. Railroads would take advantage of this flexibility to the extent that they expect the benefits from doing so would exceed the costs.

3. The rulemaking would institute more cost-effective equipment qualification and in-service monitoring requirements. Railroads could discontinue annual use of instrumented wheelsets for in-service validation, and could avoid some tests that have not provided useful data. Further, railroads could use MCAT to extend territories in which qualified equipment may operate.

4. The rulemaking would clarify that individuals qualified to inspect track need only understand the parts of the regulation relevant to the inspections they conduct and the work they perform.

Impacts

The proposed changes to geometric standards and performance standards for high-speed operations would not impact any existing high-speed operations, which are now limited to Amtrak on the Northeast Corridor, but would rather promote their safe operation. If Amtrak were to attempt to operate Acela at the current maximum allowable speeds and cant deficiencies for which it is qualified, but were to allow track deviations to reach current limits, the Acela trainset, because of its dynamic characteristics, would be subject to accelerations in excess of the limits now permitted. FRA's modeling to date has shown that Acela, as it is currently qualified to operate, would meet the safety standards proposed in this rulemaking. Future high-speed operations would be made simpler, because the railroad, if it requires equipment manufacturers to provide equipment that would meet performance requirements on minimally compliant track, would find several suppliers of off-the-shelf equipment, likely lowering bid prices and gaining multiple bidders. Assuming that absent this rulemaking, railroads would seek to have new equipment used in high-speed train operations built to performance standards at the maximum deviations permitted under the geometric standards, FRA estimates that future high-speed operations would save in the neighborhood of $2,000,000 per trainset on bids because of the simplification of the design process. FRA believes that it is not unreasonable to assume that 40 trainsets would be affected, based on current proposals for high-speed rail, and has distributed the estimated procurement dates in years 6 through 10. The annual savings would be 8*$2,000,000 (or $16,000,000) and the net discounted savings would be $46,774,146.

TABLE 1—ESTIMATED EQUIPMENT PROCUREMENT BENEFIT

Year	Annual benefit	Discount factor	Annual discounted benefit	Cumulative discounted benefit
1	$0	0.93	$0	$0
2	0	0.87	0	0
3	0	0.82	0	0
4	0	0.76	0	0
5	0	0.71	0	0
6	16,000,000	0.67	10,661,476	10,661,476
7	16,000,000	0.62	9,963,996	20,625,471
8	16,000,000	0.58	9,312,146	29,937,617
9	16,000,000	0.54	8,702,940	38,640,557
10	16,000,000	0.51	8,133,589	46,774,146
11	0	0.48	0	46,774,146
12	0	0.44	0	46,774,146
13	0	0.41	0	46,774,146
14	0	0.39	0	46,774,146

TABLE 1—ESTIMATED EQUIPMENT PROCUREMENT BENEFIT—Continued

Year	Annual benefit	Discount factor	Annual discounted benefit	Cumulative discounted benefit
15	0	0.36	0	46,774,146
16	0	0.34	0	46,774,146
17	0	0.32	0	46,774,146
18	0	0.30	0	46,774,146
19	0	0.28	0	46,774,146
20	0	0.26	0	46,774,146

The provisions for high cant deficiency operations on all track classes are permissive in nature and would create no additional costs. A railroad could either adhere to these provisions in expectation that any additional expenditure would trigger savings and result in an overall net benefit, or simply avoid triggering the provisions. High cant deficiency offers significant opportunities to reduce trip time, as it would reduce the amount of time travelled at the slowest speeds. For example, to travel a mile, a train could take 3 minutes at 20 m.p.h. or 2 minutes at 30 m.p.h. Traveling at 30 m.p.h. would reduce trip time by a minute. By contrast, a train traveling at 120 m.p.h. would take 5 minutes to travel 10 miles, while a train traveling at 150 mph would take 4 minutes to travel the same distance, reducing trip time by 1 minute relative to the train traveling at 120 m.p.h. The net time savings from traveling one mile at 30 m.p.h. instead of at 20 m.p.h. is the same as the time savings from traveling 10 miles at 150 m.p.h. instead of at 120 m.p.h. High cant deficiency can allow that kind of time savings at lower speeds, and therefore offers a relatively low-cost way of improving trip time. The United States is investing more in passenger rail transportation and this would be a very good way to make the high-speed rail system more efficient.

FRA believes that use of higher cant deficiencies will become much more common over the next years, although, nearer-term, relatively fewer opportunities for new operations at cant deficiencies in excess of 5 inches would present themselves. In any event, there could be a benefit to some operations from the potential enhanced speeds. On the Northeast Corridor, Amtrak has placed values of $2,000,000 annually or more for a reduction of 1 minute in total travel time on the south end of the Northeast Corridor, and in excess of $1,000,000 for such a reduction on the north end of the Northeast Corridor, for its high-speed operations. (*See* "Relative Impacts of On-Time Performance and Travel Time Improvements for Amtrak's Acela Express Service in the NEC," February 18, 2009, AECOM, a copy of which has been placed in the public docket for this rulemaking.) FRA estimates that, initially, high-speed operations on the Northeast Corridor would save 2 minutes of travel time, which coupled with Amtrak's estimate for time savings would translate into a value of $4,000,000 per year. Similarly, other improvements nationwide, such as extension of higher cant deficiency operations already in service in the Northwest, could result in additional savings of $4,000,000 per year after the cost of improving track geometry is considered. For purposes of this analysis, FRA estimates that more operations would take advantage of high cant deficiency possibilities starting in about year 6, and that the value would be an additional $2,000,000 per year in year 6, growing by $2,000,000 per year in years 7 through 20, eventually reaching an annual benefit of $40,000,000 in year 20, for a total discounted benefit of $193,714,398 over 20 years. All of these values are speculative, and based on significant increases in rail passenger transportation. If there is a greater increase in passenger transportation the savings would be greater; if they are not as great, the savings would be lower.

TABLE 2—ESTIMATED HIGH CANT DEFICIENCY BENEFIT

Year	Annual benefit	Discount factor	Annual discounted benefit	Cumulative discounted benefit
1	$8,000,000	0.93	$7,476,636	$7,476,636
2	8,000,000	0.87	6,987,510	14,464,145
3	8,000,000	0.82	6,530,383	20,994,528
4	8,000,000	0.76	6,103,162	27,097,690
5	8,000,000	0.71	5,703,889	32,801,579
6	10,000,000	0.67	6,663,422	39,465,002
7	12,000,000	0.62	7,472,997	46,937,999
8	14,000,000	0.58	8,148,127	55,086,126
9	16,000,000	0.54	8,702,940	63,789,066
10	18,000,000	0.51	9,150,287	72,939,353
11	20,000,000	0.48	9,501,856	82,441,209
12	22,000,000	0.44	9,768,263	92,209,472
13	24,000,000	0.41	9,959,147	102,168,619
14	26,000,000	0.39	10,083,248	112,251,867
15	28,000,000	0.36	10,148,489	122,400,356
16	30,000,000	0.34	10,162,038	132,562,394
17	32,000,000	0.32	10,130,380	142,692,774
18	34,000,000	0.30	10,059,373	152,752,147
19	36,000,000	0.28	9,954,300	162,706,447
20	38,000,000	0.26	9,819,922	172,526,370

Improvements in the use of monitoring equipment and streamlined qualification procedures have the potential to reduce costs, without any offsetting increases. The reduced need for instrumented wheelsets, instrumented cars, and related tests would save roughly $2,000,000 per year on current high-speed operations, and have the potential for similar savings on planned high-speed operations. FRA estimates that two such high-speed operations would be in place starting in year 6, each saving $2,000,000 per year. Further, FRA believes that using MCAT to extend the range of qualified equipment would save an additional $1,500,000 per year in the first five years, and that the savings would grow by $500,000 per year after year 5, as rail passenger transportation expands. MCAT would work to enhance safety, because the equipment would be shown to be safe on minimally compliant track and, as a result, would likely be safe under foreseeable conditions. In the absence of MCAT, the equipment can be qualified on very good track, which might later deteriorate over time. Although accelerometers should provide indications of such deterioration, ensuring that the equipment would be safe on track meeting the geometric limits adds to the life-cycle safety of a trainset. The total savings would grow from $3,500,000 per year in year 1 to $15,000,000 in year 20, for a total savings of $84,997,881 in costs discounted at 7% over 20 years.

TABLE 3—STREAMLINED TESTING REQUIREMENTS—ESTIMATED COST SAVINGS

Year	Annual benefit	Discount factor	Annual discounted benefit	Cumulative discounted benefit
1	$3,500,000	0.93	$3,271,028	$3,271,028
2	3,500,000	0.87	3,057,036	6,328,064
3	3,500,000	0.82	2,857,043	9,185,106
4	3,500,000	0.76	2,670,133	11,855,239
5	3,500,000	0.71	2,495,452	14,350,691
6	8,000,000	0.67	5,330,738	19,681,429
7	8,500,000	0.62	5,293,373	24,974,802
8	9,000,000	0.58	5,238,082	30,212,884
9	9,500,000	0.54	5,167,371	35,380,254
10	10,000,000	0.51	5,083,493	40,463,747
11	10,500,000	0.48	4,988,474	45,452,221
12	11,000,000	0.44	4,884,132	50,336,353
13	11,500,000	0.41	4,772,091	55,108,444
14	12,000,000	0.39	4,653,807	59,762,251
15	12,500,000	0.36	4,530,575	64,292,826
16	13,000,000	0.34	4,403,550	68,696,376
17	13,500,000	0.32	4,273,754	72,970,130
18	14,000,000	0.30	4,142,095	77,112,225
19	14,500,000	0.28	4,009,371	81,121,596
20	15,000,000	0.26	3,876,285	84,997,881

FRA believes that the proposed modifications to the qualifications requirements would have no net impact, as the changes generally codify current interpretations.

The total quantified benefits resulting from this regulatory proposal would range from $11,500,000 in year 1, to $53,000,000 in year 20, with a total, net discounted benefit of $304,298,396 over 20 years at a 7% annual discount rate. Of course, such benefits would depend on much more extensive use of rail passenger transportation, including high-speed rail, as envisioned in current infrastructure improvement and spending plans.

TABLE 4—TOTAL ESTIMATED BENEFITS

Year	Annual benefit	Discount factor	Annual discounted benefit	Cumulative discounted benefit
1	$11,500,000	0.93	$10,747,664	$10,747,664
2	11,500,000	0.87	10,044,545	20,792,209
3	11,500,000	0.82	9,387,426	30,179,635
4	11,500,000	0.76	8,773,295	38,952,929
5	11,500,000	0.71	8,199,341	47,152,271
6	34,000,000	0.67	22,655,636	69,807,906
7	36,500,000	0.62	22,730,366	92,538,272
8	39,000,000	0.58	22,698,355	115,236,627
9	41,500,000	0.54	22,573,250	137,809,877
10	44,000,000	0.51	22,367,369	160,177,246
11	30,500,000	0.48	14,490,330	174,667,576
12	33,000,000	0.44	14,652,395	189,319,971
13	35,500,000	0.41	14,731,238	204,051,209
14	38,000,000	0.39	14,737,055	218,788,264
15	40,500,000	0.36	14,679,064	233,467,328
16	43,000,000	0.34	14,565,588	248,032,915
17	45,500,000	0.32	14,404,135	262,437,050
18	48,000,000	0.30	14,201,468	276,638,518
19	50,500,000	0.28	13,963,671	290,602,189
20	53,000,000	0.26	13,696,207	304,298,396

Additional cost burden associated with information collection is presented in Section C., Paperwork Reduction Act, below. Such impacts would be relatively low compared to the cost savings that would result.

Certain refinements to the testing requirements would yield greater confidence in the test results and thus enhanced safety levels. Such benefits are not readily quantifiable, and FRA has not attempted to quantify them.

In summary, the enhanced safety levels coupled with the cost savings would justify the new cost burden resulting from this proposal. FRA requests comments on all aspects of its economic analysis presented here.

B. Regulatory Flexibility Act and Executive Order 13272

To ensure that the potential impact of this rulemaking on small entities is properly considered, FRA developed this proposed rule in accordance with Executive Order 13272 ("Proper Consideration of Small Entities in Agency Rulemaking") and DOT's policies and procedures to promote compliance with the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*). The Regulatory Flexibility Act requires an agency to review regulations to assess their impact on small entities. An agency must conduct a regulatory flexibility analysis unless it determines and certifies that a rule is not expected to have a significant economic impact on a substantial number of small entities.

The U.S. Small Business Administration (SBA) stipulates in its "Size Standards" that the largest a railroad business firm that is "for-profit" may be, and still be classified as a "small entity," is 1,500 employees for "Line-Haul Operating Railroads," and 500 employees for "Switching and Terminal Establishments." "Small entity" is defined in the Regulatory Flexibility Act as a small business that is not independently owned and operated, and is not dominant in its field of operation. SBA's "Size Standards" may be altered by Federal agencies after consultation with SBA and in conjunction with public comment. Pursuant to that authority, FRA has published a final policy that formally establishes "small entities" as Class III railroads, contractors, and shippers meeting the economic criteria established for Class III railroads in 49 CFR 1201.1–1, and commuter railroads or small governmental jurisdictions that serve populations of 50,000 or less. No shippers, contractors, or small governmental jurisdictions would be impacted by this proposal. At present there are no small entity commuter railroads, and FRA believes that were such a small commuter railroad to commence operations, it is extremely unlikely that it would engage in high cant deficiency operations because such operations require relatively expensive rolling equipment capable of tilting to give a safe and comfortable ride to passengers.

The Class III revenue requirement is currently $20 million or less in annual operating revenue. The $20 million limit (which is adjusted by applying the railroad revenue deflator adjustment) is based on the Surface Transportation Board's (STB) threshold for a Class III railroad carrier. FRA uses the same revenue dollar limit to determine whether a railroad or shipper or contractor is a small entity. At present, no small entities would be affected by either the high-speed provisions or the high cant deficiency provisions. To the extent that new passenger railroads are small entities, and want to take advantage of high cant deficiency operations and have the means to do so, they would benefit. Small freight railroads hosting passenger operations could recoup any costs of maintaining infrastructure, through trackage agreements which enable host railroads to recover marginal costs of permitting passenger operations over their tracks, to accommodate high cant deficiency operations, or could refuse to host such high cant deficiency operations, as appropriate. Nonetheless, FRA does not foresee any situation under which a small entity might be impacted by the high speed provisions in this proposal.

Based on these determinations, FRA certifies that it expects that, as a result of this rulemaking, there will be no significant impact on a substantial number of small entities. FRA requests comments on both this analysis and this certification.

C. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted to the Office of Management and Budget (OMB) for review and approval in accordance with the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). The sections that contain both proposed and current information collection requirements, and the estimated time to fulfill those requirements, are summarized in the following table.

CFR Section	Respondent universe	Total annual responses	Average time per response	Total annual burden hours
213.4—Excepted Track:				
—Designation of track as excepted	200 railroads	20 orders	15 minutes	5
—Notification to FRA about removal of excepted track.	200 railroads	15 notification	10 minutes	3
213.5—Responsibility for Compliance	728 railroads	10 notification	8 hours	80
213.7—Designation of Qualified Persons to Supervise Certain Renewals and Inspect Track:				
—Designations	728 railroads	1,500 names	10 minutes	250
—Employees trained in CWR procedures	31 railroads	80,000 employees	90 minutes	120,000
—Written authorizations and recorded exams.	31 railroads	80,000 authorizations + 80,000 exams.	10 minutes + 60 minutes.	93,333
—Designations (partially qualified) under paragraph (d) of this section.	31 railroads	250 names	10 minutes	42
213.17—Waivers	728 railroads	6 petitions	24 hours	144
213.57—Curves; Elevation and Speed Limitations:				
—Request to FRA for vehicle type approval	728 railroads	2 requests/documents	40 hours	80
—Notification to FRA prior to implementation of higher curving speeds.	728 railroads	2 notifications	45 minutes	2
—Railroad notification to FRA of providing commuter/passenger service over trackage of more than 1 track owner with same vehicle type.	728 railroads	2 notifications	45 minutes	2

CFR Section	Respondent universe	Total annual responses	Average time per response	Total annual burden hours
—Written consent of other affected track owners by railroad.	728 railroads	2 consents	8 hours	16
213.110— Gage Restraint Measurement Systems (GRMS):				
—Implementing GRMS—notices and reports.	728 railroads	5 notifications + 1 technical report.	45 minutes/4 hours	8
—GRMS vehicle output reports	728 railroads	50 reports	5 minutes	4
—GRMS vehicle exception reports	728 railroads	50 reports	5 minutes	4
—GRMS/PTLF procedures for data integrity	728 railroads	4 procedure documents	2 hours	8
—GRMS training programs/sessions	728 railroads	2 programs + 5 sessions.	16 hours	112
—GRMS inspection records	728 railroads	50 records	2 hours	100
213.118—Continuous Welded Rail (CWR); Plan Review and Approval:				
—Plans	728 railroads	728 reviewed plans	4 hours	2,912
—Notification to FRA and employees of plan effective date.	728 railroads	728 notifications + 80,000 notifications.	15 minutes + 2 minutes	2,849
—Written submissions in support of plan	728 railroads	20 submissions	2 hours	40
—FRA-required revisions to CWR plan	728 railroads	20 reviewed plans	1 hour	20
213.119—Continuous Welded rail (CWR), Plan Contents:				
—Fracture report for each broken CWR joint bar.	239 railroads/1 association.	12,000 reports	10 minutes	2,000
—Petition for technical conference on fracture reports.	1 association	1 petition	15 minutes	.25
—Training programs on CWR procedures	239 railroads/1 association.	240 amended programs.	1 hour	240
—Annual CWR training of employees	31 railroads	80,000 employees	30 minutes	40,000
—Recordkeeping (track with CWR)	239 railroads	2,000 records	10 minutes	333
—Recordkeeping for CWR rail joints	239 railroads	360,000 records	2 minutes	12,000
—Periodic records for CWR rail joints	239 railroads	480,000 records	1 minute	8,000
—Copy of track owner's CWR procedures	728 railroads	239 manuals	10 minutes	40
213.233—Track Inspections:				
—Notations	728 railroads	12,500 notations	1 minute	208
213.241—Inspection Records	728 railroads	1,542,089 records	Varies	1,672,941
213.303—Responsibility for Compliance	2 railroads	1 petition	8 hours	8
213.305—Designation of Qualified Individuals; General Qualifications:				
—Designations	2 railroads	150 designations	10 minutes	25
—Designations (partially qualified) under paragraph (d) of this section.	2 railroads	20 designations	10 minutes	3
213.317—Waivers	2 railroads	1 petition	80 hours	80
213.329— Curves, Elevation and Speed Limitations:				
—FRA approval of qualified vehicle types based on results of testing.	728 railroads	2 documents	40 hours	80
—Written notification to FRA 30 days prior to implementation of higher curving speeds.	728 railroads	2 notifications	45 minutes	2
—Written notification to FRA by railroad providing commuter/passenger Service over trackage of more than 1 track owner with same vehicle type.	728 railroads	2 notifications	45 minutes	2
—Written consent of other affected track owners by railroad.	728 railroads	2 consents	8 hours	16
213.333—Automated Vehicle Inspection Systems:				
—Track Geometry Measurement System (TGMS): reports.	10 railroads	18 reports	30 hours	540
—TGMS: copies of most recent exception printouts.	10 railroads	13 printouts	20 hours	260
—Notification to track personnel when on-board accelerometers indicate track-related problem (new requirement).	10 railroads	5 notifications	40 hours	200
—Requests for an alternate location for device measuring lateral accelerations (new requirement).	10 railroads	10 requests	40 hours	400
—Report to FRA providing analysis of collected monitoring data (new requirement).	10 railroads	2,080 reports	6 hours	12,480
213.341—Initial Inspection of New Rail and Welds:				
—Mill inspection—copy of manufacturer's report.	2 railroads	2 reports	16 hours	32

CFR Section	Respondent universe	Total annual responses	Average time per response	Total annual burden hours
—Welding plan inspection report	2 railroads	2 reports	16 hours	32
—Inspection of field welds	2 railroads	125 records	20 minutes	42
213.343—Continuous Welded Rail (CWR):				
—Recordkeeping	2 railroads	150 records	10 minutes	25
213.345—Vehicle/Track System Qualification:				
—Qualification program for all vehicle types operating at track Class 6 speeds or above or at curving speeds above 5 inches of cant deficiency (new requirement).	10 railroads	10 programs	120 hours	1,200
—Qualification program for previously qualified vehicle types (new requirement).	10 railroads	10 programs	80 hours	800
213.347—Automotive or Railroad Crossings at Grade:				
—Protection plans	1 railroad	2 plans	8 hours	16
213.369—Inspection Records:				
—Record of inspection of track	2 railroads	500 records	1 minute	8
—Internal defect inspections and remedial action taken.	2 railroads	50 records	5 minutes	4
Appendix D—Minimally Compliant Analytical Track (MCAT) Simulations Used for Qualifying Vehicles to Operate at High Speeds and at High Cant Deficiencies:				
—Identification of non-redundant suspension system element or component that may present a single point of failure (new requirement).	10 railroads	20 identified elements/ components.	160 hours	3,200

All estimates include the time for reviewing instructions, searching existing data sources, gathering or maintaining the needed data, and reviewing the information. Pursuant to 44 U.S.C. 3506(c)(2)(B), FRA solicits comments concerning: Whether these information collection requirements are necessary for the proper performance of the functions of FRA, including whether the information has practical utility; the accuracy of FRA's estimates of the burden of the information collection requirements; the quality, utility, and clarity of the information to be collected; and whether the burden of collection of information on those who are to respond, including through the use of automated collection techniques or other forms of information technology, may be minimized. For information or a copy of the paperwork package submitted to OMB, contact Mr. Robert Brogan, Information Clearance Officer, Federal Railroad Administration, at 202–493–6292, or Ms. Kimberly Toone, Information Clearance Officer, Federal Railroad Administration, at 202–493–6132.

Organizations and individuals desiring to submit comments on the collection of information requirements should direct them to Mr. Robert Brogan or Ms. Kimberly Toone, Federal Railroad Administration, 1200 New Jersey Avenue, SE., Third Floor, Washington, DC 20590. Comments may also be submitted via e-mail to Mr. Brogan or Ms. Toone at the following, respective addresses: *Robert.Brogan@dot.gov,* or *Kimberly.Toone@dot.gov.* Copies of such comments may also be submitted to OMB at the Office of Management and Budget, 725 17th St., NW., Washington, DC 20590, Attn: FRA OMB Desk Officer, or via e-mail at *oira_submissions@omb.eop.gov.*

OMB is required to make a decision concerning the collection of information requirements contained in this proposed rule between 30 and 60 days after publication of this document in the **Federal Register.** Therefore, a comment is best assured of having its full effect if received within 30 days of publication. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

FRA is not authorized to impose a penalty on persons for violating information collection requirements that do not display a current OMB control number, if required. FRA intends to obtain current OMB control numbers for any new information collection requirements resulting from this rulemaking action prior to the effective date of the final rule. The OMB control number, when assigned, will be announced by separate notice in the **Federal Register**.

D. Federalism Implications

This NPRM has been analyzed in accordance with the principles and criteria contained in Executive Order 13132, "Federalism" (*see* 64 FR 43255 (Aug. 10, 1999)). Executive Order 13132 requires FRA to develop an accountable process to ensure "meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications." "Policies that have federalism implications" are defined in the Executive Order to include regulations that have "substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government." Under Executive Order 13132, the agency may not issue a regulation with federalism implications that imposes substantial direct compliance costs and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, the agency consults with State and local governments, or the agency consults with State and local government officials early in the process of developing the regulation. Where a regulation has federalism implications and preempts State law, the agency seeks to consult with State and local officials in the process of developing the regulation.

FRA has determined that this regulatory action will not have substantial direct effects on the States, on the relationship between the national government and the States, nor on the distribution of power and responsibilities among the various levels of government. In addition, FRA has determined that this regulatory action would not impose substantial direct compliance costs on State and local governments. Therefore, the consultation and funding requirements of Executive Order 13132 do not apply.

However, the final rule arising from this regulatory action would have preemptive effect. Section 20106 of title 49, United States Code, (Section 20106) provides that States may not adopt or continue in effect any law, regulation, or order related to railroad safety or security that covers the subject matter of a regulation prescribed or issued by the Secretary of Transportation (with respect to railroad safety matters) or the Secretary of Homeland Security (with respect to railroad security matters), except when the State law, regulation, or order qualifies under the "essentially local safety or security hazard" exception to Section 20106. The intent of Section 20106 is to promote national uniformity in railroad safety and security standards. 49 U.S.C. 20106(a)(1). Thus, subject to a limited exception for essentially local safety or security hazards, the final rule arising from this rulemaking would establish a uniform Federal safety standard that must be met, and State requirements covering the same subject matter are displaced, whether those State requirements are in the form of a State law (including common law), regulation, or order.

While the final rule arising from this rulemaking would establish Federal standards of care which preempt State standards of care, the final rule would not preempt an action under State law seeking damages for personal injury, death, or property damage alleging that a party has failed to comply with the Federal standard of care established by this rulemaking, including a plan or program required by this rulemaking. Provisions of a plan or program which exceed the requirements of this rulemaking are not included in the Federal standard of care.

FRA does note that under 49 U.S.C. 20701–20703 (formerly the Locomotive (Boiler) Inspection Act) (LBIA), the field of locomotive safety is preempted, extending to the design, the construction, and the material of every part of the locomotive and tender and all appurtenances thereof. To the extent that this rulemaking establishes requirements affecting locomotive safety, the scope of preemption is provided by 49 U.S.C. 20701–20703.

In sum, FRA has analyzed this regulatory action in accordance with the principles and criteria contained in Executive Order 13132. As explained above, FRA has determined that this regulatory action has no federalism implications, other than the preemption of State laws covering the subject matter of this rulemaking, which occurs by operation of law under 49 U.S.C. 20106 whenever FRA issues a rule or order, and under the LBIA (49 U.S.C. 20701–20703) by its terms. Accordingly, FRA has determined that preparation of a federalism summary impact statement for this proposed rule is not required.

E. Environmental Impact

FRA has evaluated this NPRM in accordance with its "Procedures for Considering Environmental Impacts" (FRA's Procedures) (*see* 64 FR 28545 (May 26, 1999)) as required by the National Environmental Policy Act (*see* 42 U.S.C. 4321 *et seq.*), other environmental statutes, Executive Orders, and related regulatory requirements. FRA has determined that this action is not a major FRA action (requiring the preparation of an environmental impact statement or environmental assessment) because it is categorically excluded from detailed environmental review pursuant to section 4(c)(20) of FRA's Procedures. *See* 64 FR 28547 (May 26, 1999). In accordance with section 4(c) and (e) of FRA's Procedures, the agency has further concluded that no extraordinary circumstances exist with respect to this NPRM that might trigger the need for a more detailed environmental review. As a result, FRA finds that this NPRM is not a major Federal action significantly affecting the quality of the human environment.

F. Unfunded Mandates Reform Act

Pursuant to Section 201 of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4, 2 U.S.C. 1531), each Federal agency "shall, unless otherwise prohibited by law, assess the effects of Federal regulatory actions on State, local, and Tribal governments, and the private sector (other than to the extent that such regulations incorporate requirements specifically set forth in law)." Section 202 of the Act (2 U.S.C. 1532) further requires that "before promulgating any general notice of proposed rulemaking that is likely to result in the promulgation of any rule that includes any Federal mandate that may result in expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector, of $100,000,000 or more (adjusted annually for inflation) in any 1 year, and before promulgating any final rule for which a general notice of proposed rulemaking was published, the agency shall prepare a written statement" detailing the effect on State, local, and Tribal governments and the private sector. The proposed rule will not result in the expenditure, in the aggregate, of $100,000,000 or more (as adjusted annually for inflation) in any one year, and thus preparation of such a statement is not required.

G. Energy Impact

Executive Order 13211 requires Federal agencies to prepare a Statement of Energy Effects for any "significant energy action." *See* 66 FR 28355 (May 22, 2001). Under the Executive Order, a "significant energy action" is defined as any action by an agency (normally published in the **Federal Register**) that promulgates or is expected to lead to the promulgation of a final rule or regulation, including notices of inquiry, advance notices of proposed rulemaking, and notices of proposed rulemaking: (1)(i) That is a significant regulatory action under Executive Order 12866 or any successor order, and (ii) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (2) that is designated by the Administrator of the Office of Information and Regulatory Affairs as a significant energy action.

FRA has evaluated this NPRM in accordance with Executive Order 13211. FRA has determined that this NPRM is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Consequently, FRA has determined that this regulatory action is not a "significant energy action" within the meaning of the Executive Order.

H. Trade Impact

The Trade Agreements Act of 1979 (Pub. L. 96–39, 19 U.S.C. 2501 *et seq.*) prohibits Federal agencies from engaging in any standards or related activities that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards.

FRA has assessed the potential effect of this rulemaking on foreign commerce and believes that the proposed requirements are consistent with the Trade Agreements Act. The requirements proposed are safety standards, which, as noted, are not considered unnecessary obstacles to trade. Moreover, FRA has sought, to the extent practicable, to state the requirements in terms of the performance desired, rather than in more narrow terms restricted to a particular vehicle design, so as not to limit different, compliant designs by any manufacturer—foreign or domestic. FRA has also taken into consideration of international standards for the safe interaction of vehicles and the track over which they operate, such as standards for steady-state, lateral acceleration of passenger carbodies.

I. Privacy Act

Anyone is able to search the electronic form of all comments received into any of DOT's dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, *etc.*). You may review DOT's complete Privacy Act Statement published in the **Federal Register** on April 11, 2000 (65 FR 19477–78), or you may visit *http://DocketsInfo.dot.gov.*

List of Subjects

49 CFR Part 213

Penalties, Railroad safety, Reporting and recordkeeping requirements.

49 CFR Part 238

Passenger equipment, Penalties, Railroad safety, Reporting and recordkeeping requirements.

The Proposed Rule

For the reasons discussed in the preamble, FRA proposes to amend parts 213 and 238 of chapter II, subtitle B of Title 49, Code of Federal Regulations, as follows:

PART 213—[AMENDED]

1. The authority citation for part 213 is revised to read as follows:

Authority: 49 U.S.C. 20102–20114 and 20142; 28 U.S.C. 2461, note; and 49 CFR 1.49.

Subpart A—General

2. Section 213.7 is amended by revising paragraphs (a)(2)(i) and (b)(2)(i) to read as follows:

§ 213.7 Designation of qualified persons to supervise certain renewals and inspect track.

(a) * * *

(2) * * *

(i) Knows and understands the requirements of this part that apply to the restoration and renewal of the track for which he or she is responsible;

* * * * *

(b) * * *

(2) * * *

(i) Knows and understands the requirements of this part that apply to the inspection of the track for which he or she is responsible;

* * * * *

Subpart C—Track Geometry

3. Section 213.55 is revised to read as follows:

§ 213.55 Track alinement.

(a) Except as provided in paragraph (b) of this section, alinement may not deviate from uniformity more than the amount prescribed in the following table:

Class of track	Tangent track	Curved track	
	The deviation of the mid-offset from a 62-foot line[1] may not be more than—(inches)	The deviation of the mid-ordinate from a 31-foot chord[2] may not be more than—(inches)	The deviation of the mid-ordinate from a 62-foot chord[2] may not be more than— (inches)
Class 1 track	5	[3]N/A	5
Class 2 track	3	[3]N/A	3
Class 3 track	1¾	1¼	1¾
Class 4 track	1½	1	1½
Class 5 track	¾	½	⅝

[1] The ends of the line shall be at points on the gage side of the line rail, five-eighths of an inch below the top of the railhead. Either rail may be used as the line rail; however, the same rail shall be used for the full length of that tangential segment of the track.
[2] The ends of the chord shall be at points on the gage side of the outer rail, five-eighths of an inch below the top of the railhead.
[3] N/A—Not Applicable.

(b) For operations at a qualified cant deficiency, E_u, of more than 5 inches, the alinement of the outside rail of the curve may not deviate from uniformity more than the amount prescribed in the following table:

Class of track	Curved track[5]	
	The deviation of the mid-ordinate from a 31-foot chord[2] may not be more than—(inches)	The deviation of the mid-ordinate from a 62-foot chord[2] may not be more than—(inches)
Class 1 track[4]	[3]N/A	1¼
Class 2 track[4]	[3]N/A	1¼
Class 3 track	¾	1¼
Class 4 track	¾	⅞
Class 5 track	½	⅝

[4] Restraining rails or other systems may be required for derailment prevention.
[5] Curved track limits shall be applied only when track curvature is greater than 0.25 degree.

4. Section 213.57 is revised to read as follows:

§ 213.57 Curves; elevation and speed limitations.

(a) The maximum elevation of the outside rail of a curve may not be more than 8 inches on track Classes 1 and 2, and 7 inches on track Classes 3 through 5. The outside rail of a curve may not be lower than the inside rail, except as a result of a deviation as per § 213.63.

(b) All vehicle types requiring qualification under § 213.345 must demonstrate that when stopped on a curve having a maximum uniform elevation of 7 inches, no wheel unloads to a value less than 50 percent of its static weight on level track.

(c) The maximum posted timetable operating speed for each curve is determined by the following formula—

$$V_{max} = \sqrt{\frac{E_a + E_u}{0.0007D}}$$

Where:

V_{max} = Maximum posted timetable operating speed (m.p.h.).

E_a = Actual elevation of the outside rail (inches).[1]

E_u = Qualified cant deficiency [2] (inches) of the vehicle type.

D = Degree of curvature (degrees).[3]

(d) All vehicles are considered qualified for operating on track with a cant deficiency, E_u, not exceeding 3 inches. Table 1 of appendix A to this part is a table of speeds computed in accordance with the formula in paragraph (c) of this section, when E_u equals 3 inches, for various elevations and degrees of curvature.

(e) Each vehicle type must be approved by FRA to operate on track with a qualified cant deficiency, E_u, greater than 3 inches. Each vehicle type must demonstrate compliance with the requirements of either paragraph (e)(1) or (e)(2) of this section.

(1) When positioned on track with a uniform superelevation equal to the proposed cant deficiency:

(i) No wheel of the vehicle unloads to a value less than 60 percent of its static value on perfectly level track; and

(ii) For passenger cars, the roll angle between the floor of the equipment and the horizontal does not exceed 8.6 degrees; or

(2) When operating through a constant radius curve at a constant speed corresponding to the proposed cant deficiency, and if a test plan is submitted and approved by FRA in accordance with § 213.345 (e) and (f):

(i) The steady-state (average) load on any wheel, throughout the body of the curve, is not less than 60 percent of its static value on perfectly level track; and

(ii) For passenger cars, the steady-state (average) lateral acceleration measured on the floor of the carbody does not exceed 0.15g.

(f) The track owner or railroad shall transmit the results of the testing specified in paragraph (e) of this section to FRA requesting approval for the vehicle type to operate at the desired speeds allowed under the formula in paragraph (c) of this section. The request shall be in writing and shall contain, at a minimum, the following information—

(1) A description of the vehicle type involved, including schematic diagrams of the suspension system(s) and the estimated location of the center of gravity above top of rail;

(2) The test procedure [4] and description of the instrumentation used to qualify the vehicle and the maximum values for wheel unloading and roll angles or accelerations that were observed during testing; and

(3) For vehicle types not subject to parts 229 or 238 of this chapter, procedures or standards in effect that relate to the maintenance of all safety-critical components of the suspension system(s) for the particular vehicle type. Safety-critical components of the suspension system are those that impact or have significant influence on the roll of the carbody and the distribution of weights on the wheels.

(g) Upon FRA approval of the request, the track owner or railroad shall notify FRA's Associate Administrator for Railroad Safety/Chief Safety Officer in writing no less than 30 calendar days prior to the proposed implementation of the approved higher curving speeds allowed under the formula in paragraph (c) of this section. The notification shall contain, at a minimum, identification of the track segment(s) on which the higher curving speeds are to be implemented. In approving the request in paragraph (f) of this section, FRA may impose conditions necessary for safely operating at the higher curving speeds.

(h) A track owner or railroad that provides passenger or commuter service over trackage of more than one track owner with the same vehicle type may provide written notification to the FRA with the written consent of the other affected track owners.

(i) For vehicle types intended to operate at any curving speed producing more than 5 inches of cant deficiency, the following provisions of subpart G of this part shall apply: §§ 213.333(a) through (g), (j)(1), (k) and (m), 213.345, and 213.369(f).

(j) Vehicle types that have been permitted by FRA to operate at cant deficiencies, E_u, greater than 3 inches prior to [DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER], shall be considered qualified under this section to operate at those permitted cant deficiencies over the previously operated track segment(s).

(k) As used in this section—

(1) *Vehicle* means a locomotive, as defined in § 229.5 of this part; a freight car, as defined in § 215.5 of this part; a passenger car, as defined in § 238.5 of this part; and any rail rolling equipment used in a train with either a freight car or a passenger car.

(2) *Vehicle type* means vehicles with variations in their physical properties, such as suspension, mass, interior arrangements, and dimensions that do not result in significant changes to their dynamic characteristics.

5. Section 213.63 is revised to read as follows:

§ 213.63 Track surface.

(a) Except as provided in paragraph (b) of this section, each track owner shall maintain the surface of its track within the limits prescribed in the following table:

Track surface (inches)	Class of track				
	1	2	3	4	5
The runoff in any 31 feet of rail at the end of a raise may not be more than	3½	3	2	1½	1
The deviation from uniform profile on either rail at the mid-ordinate of a 62-foot chord may not be more than	3	2¾	2¼	2	1¼

[1] Actual elevation, E_a, for each 155-foot track segment in the body of the curve is determined by averaging the elevation for 11 points through the segment at 15.5-foot spacing. If the curve length is less than 155 feet, average the points through the full length of the body of the curve.

[2] If the actual elevation, E_a, and degree of curvature, D, change as a result of track degradation, then the actual cant deficiency for the maximum posted timetable operating speed, V_{max}, may be greater than the qualified cant deficiency, E_u. This actual cant deficiency for each curve may not exceed the qualified cant deficiency, E_u, plus 1 inch.

[3] Degree of curvature, D, is determined by averaging the degree of curvature over the same track segment as the elevation.

[4] The test procedure may be conducted whereby all the wheels on one side (right or left) of the vehicle are raised to the proposed cant deficiency and lowered, and then the vertical wheel loads under each wheel are measured and a level is used to record the angle through which the floor of the vehicle has been rotated.

Track surface (inches)	Class of track				
	1	2	3	4	5
The deviation from zero crosslevel at any point on tangent or reverse crosslevel elevation on curves may not be more than	3	2	1¾	1¼	1
The difference in crosslevel between any two points less than 62 feet apart may not be more than* [1] [2]	3	2¼	2	1¾	1½
*Where determined by engineering decision prior to June 22, 1998, due to physical restrictions on spiral length and operating practices and experience, the variation in crosslevel on spirals per 31 feet may not be more than	2	1¾	1¼	1	¾

[1] Except as limited by § 213.57(a), where the elevation at any point in a curve equals or exceeds 6 inches, the difference in crosslevel within 62 feet between that point and a point with greater elevation may not be more than 1½ inches.

[2] However, to control harmonics on Class 2 through 5 jointed track with staggered joints, the crosslevel differences shall not exceed 1¼ inches in all of six consecutive pairs of joints, as created by seven low joints. Track with joints staggered less than 10 feet apart shall not be considered as having staggered joints. Joints within the seven low joints outside of the regular joint spacing shall not be considered as joints for purposes of this footnote.

(b) For operations at a qualified cant deficiency, E_u, of more than 5 inches, each track owner shall maintain the surface of the curve within the limits prescribed in the following table:

Track surface [4] (inches)	Class of track				
	1	2	3	4	5
The deviation from uniform profile on either rail at the mid-ordinate of a 31-foot chord may not be more than	N/A [3]	N/A [3]	1	1	1
The deviation from uniform profile on either rail at the mid-ordinate of a 62-foot chord may not be more than	2¼	2¼	1¾	1¼	1
The difference in crosslevel between any two points less than 10 feet apart (short warp) shall not be more than	2	2	1¾	1¾	1½

[3] N/A—Not Applicable.

[4] Curved track surface limits shall be applied only when track curvature is greater than 0.25 degree.

6. Section 213.65 is added to read as follows:

§ 213.65 Combined alinement and surface deviations.

On any curved track where operations are conducted at a qualified cant deficiency, E_u, greater than 5 inches, the combination of alinement and surface deviations for the same chord length on the outside rail in the curve, as measured by a TGMS, shall comply with the following formula:

$$\frac{3}{4} \times \left| \frac{A_m}{A_L} + \frac{S_m}{S_L} \right| \leq 1$$

Where:

A_m = measured alinement deviation from uniformity (outward is positive, inward is negative).

A_L = allowable alinement limit as per § 213.55(b) (always positive) for the class of track.

S_m = measured profile deviation from uniformity (down is positive, up is negative).

S_L = allowable profile limit as per § 213.63(b) (always positive) for the class of track.

$$\left| \frac{A_m}{A_L} + \frac{S_m}{S_L} \right| = \text{the absolute (positive) value of the result of } \frac{A_m}{A_L} + \frac{S_m}{S_L}.$$

7. Section 213.110 is amended by revising paragraphs (c) through (f), (l), (p)(2) and (p)(3) to read as follows:

§ 213.110 Gage restraint measurement systems.

* * * * *

(c)(1) The track owner shall also provide to FRA sufficient technical data to establish compliance with the following minimum design requirements of a GRMS vehicle:

(2) Gage restraint shall be measured between the heads of rail—

(i) At an interval not exceeding 16 inches;

(ii) Under an applied vertical load of no less than 10 kips per rail; and

(iii) Under an applied lateral load that provides for a lateral/vertical load ratio of between 0.5 and 1.25 [5], and a load severity greater than 3 kips but less than 8 kips per rail.

(d) Load severity is defined by the formula:

$$S = L - cV$$

Where:

S = Load severity, defined as the lateral load applied to the fastener system (kips).

L = Actual lateral load applied (kips).

c = Coefficient of friction between rail/tie, which is assigned a nominal value of 0.4.

V = Actual vertical load applied (kips), or static vertical wheel load if vertical load is not measured.

(e) The measured gage values shall be converted to a Projected Loaded Gage 24 (PLG24) as follows—

$$PLG24 = UTG + A \times (LTG - UTG)$$

Where:

UTG = Unloaded track gage measured by the GRMS vehicle at a point no less than 10 feet from any lateral or vertical load application.

[5] GRMS equipment using load combinations developing L/V ratios that exceed 0.8 shall be operated with caution to protect against the risk of wheel climb by the test wheelset.

LTG = Loaded track gage measured by the GRMS vehicle at a point no more than 12 inches from the lateral load application point.

A = The extrapolation factor used to convert the measured loaded gage to expected loaded gage under a 24,000-pound lateral load and a 33,000-pound vertical load.

For all track—

$$A = \frac{13.513}{(.001 \times L - .000258 \times V) - .009 \times (.001 \times L - .000258 \times V)^2}$$

Note: The A factor shall not exceed a value of 3.184 under any valid loading configuration.

Where:

L = Actual lateral load applied (kips).

V = Actual vertical load applied (kips), or static vertical wheel load if vertical load is not measured.

(f) The measured gage and load values shall be converted to a Gage Widening Projection (GWP) as follows:

$$GWP = (LTG - UTG) \times \frac{8.26}{L - 0.258 \times V}$$

* * * * *

(l) The GRMS record of lateral restraint shall identify two exception levels. At a minimum, the track owner shall initiate the required remedial action at each exception level as defined in the following table—

GRMS parameters [1]	If measurement value exceeds	Remedial action required
First Level Exception		
UTG	58 inches	(1) Immediately protect the exception location with a 10 m.p.h. speed restriction, then verify location; (2) Restore lateral restraint and maintain in compliance with PTLF criteria as described in paragraph (m) of this section; and (3) Maintain compliance with § 213.53(b) as measured with the PTLF.
LTG	58 inches.	
PLG24	59 inches.	
GWP	1.0 inch.	
Second Level Exception		
LTG	57¾ inches on Class 4 and 5 track [2].	(1) Limit operating speed to no more than the maximum allowable under § 213.9 for Class 3 track, then verify location; (2) Maintain in compliance with PTLF criteria as described in paragraph (m) of this section; and
PLG24	58 inches	(3) Maintain compliance with § 213.53(b) as measured with the PTLF.
GWP	0.75 inch.	

[1] Definitions for the GRMS parameters referenced in this table are found in paragraph (p) of this section.

[2] This note recognizes that typical good track will increase in total gage by as much as one-quarter of an inch due to outward rail rotation under GRMS loading conditions. For Class 2 and 3 track, the GRMS LTG values are also increased by one-quarter of an inch to a maximum of 58 inches. However, for any class of track, GRMS LTG values in excess of 58 inches are considered First Level exceptions and the appropriate remedial actions must be taken by the track owner. This one-quarter-inch increase in allowable gage applies only to GRMS LTG. For gage measured by traditional methods, or with the use of the PTLF, the table in § 213.53(b) applies.

* * * * *

(p) * * *

(2) *Gage Widening Projection (GWP)* means the measured gage widening, which is the difference between loaded and unloaded gage, at the applied loads, projected to reference loads of 16,000 pounds of lateral force and 33,000 pounds of vertical force.

(3) *L/V ratio* means the numerical ratio of lateral load applied at a point on the rail to the vertical load applied at that same point. GRMS design requirements specify an L/V ratio of between 0.5 and 1.25.

* * * * *

Subpart G—Train Operations at Track Classes 6 and Higher

8. Section 213.305 is amended by revising paragraphs (a)(2)(i) and (b)(2)(i) to read as follows:

§ 213.305 Designation of qualified individuals; general qualifications.

* * * * *

(a) * * *

(2) * * *

(i) Knows and understands the requirements of this subpart that apply to the restoration and renewal of the track for which he or she is responsible;

* * * * *

(b) * * *

(2) * * *

(i) Knows and understands the requirements of this subpart that apply to the inspection of the track for which he or she is responsible.

* * * * *

9. Section 213.307 is amended by revising the section heading and paragraph (a) to read as follows:

§ 213.307 Classes of track: Operating speed limits.

(a) Except as provided in paragraph (b) of this section and as otherwise provided in this subpart G, the following maximum allowable speeds apply:

Over track that meets all of the requirements prescribed in this subpart for—	The maximum allowable operating speed for trains is [1]
Class 6 track	110 m.p.h.

Over track that meets all of the requirements prescribed in this subpart for—	The maximum allowable operating speed for trains is [1]
Class 7 track	125 m.p.h.
Class 8 track	160 m.p.h.[2]
Class 9 track	220 m.p.h.[2]

[1] Freight may be transported at passenger train speeds if the following conditions are met:
(1) The vehicles utilized to carry such freight are of equal dynamic performance and have been qualified in accordance with § 213.329 and § 213.345.
(2) The load distribution and securement in the freight vehicle will not adversely affect the dynamic performance of the vehicle. The axle loading pattern is uniform and does not exceed the passenger locomotive axle loadings utilized in passenger service operating at the same maximum speed.
(3) No carrier may accept or transport a hazardous material, as defined at 49 CFR 171.8, except as provided in Column 9A of the Hazardous Materials Table (49 CFR 172.101) for movement in the same train as a passenger-carrying vehicle or in Column 9B of the Table for movement in a train with no passenger-carrying vehicles.
[2] Operating speeds in excess of 150 m.p.h. are authorized by this part only in conjunction with a rule of particular applicability addressing other safety issues presented by the system.

* * * * *

10. Section 213.323 is amended by revising paragraph (b) to read as follows:

§ 213.323 Track gage.

* * * * *

(b) Gage shall be within the limits prescribed in the following table:

Class of track	The gage must be at least—	But not more than—	The change of gage within 31 feet must not be greater than—
Class 6 track	4′8″	4′9¼″	¾″
Class 7 track	4′8″	4′9¼″	½″
Class 8 track	4′8″	4′9¼″	½″
Class 9 track	4′8¼″	4′9¼″	½″

11. Section 213.327 is revised to read as follows:

§ 213.327 Track alinement.

(a) Uniformity at any point along the track is established by averaging the measured mid-chord offset values for nine consecutive points that are centered around that point and spaced according to the following table:

Chord length	Spacing
31′	7′9″
62′	15′6″
124′	31′0″

(b) Except as provided in paragraph (c) of this section, a single alinement deviation from uniformity may not be more than the amount prescribed in the following table:

Class of track	Tangent/curved track	The deviation from uniformity of the mid-chord offset for a 31-foot chord may not be more than—(inches)	The deviation from uniformity of the mid-chord offset for a 62-foot chord may not be more than—(inches)	The deviation from uniformity of the mid-chord offset for a 124-foot chord may not be more than—(inches)
Class 6 track	Tangent	½	¾	1½
	Curved [1]		⅝	
Class 7 track	Tangent	½	¾	1¼
	Curved [1]		½	
Class 8 track	Tangent	½	¾	1
	Curved [1]		½	¾
Class 9 track	Tangent	½	½	¾
	Curved [1].			

[1] Curved track limits shall be applied only when track curvature is greater than 0.25 degree. Track curvature may be established at any point by averaging the measured 62-foot chord offset values for nine consecutive points that are centered around that point and spaced at 15 feet 6 inches.

(c) For operations at a qualified cant deficiency, E_u, of more than 5 inches, a single alinement deviation from uniformity of the outside rail of the curve may not be more than the amount prescribed in the following table:

Class of track	Track type	The deviation from uniformity of the mid-chord offset for a 31-foot chord may not be more than—(inches)	The deviation from uniformity of the mid-chord offset for a 62-foot chord may not be more than—(inches)	The deviation from uniformity of the mid-chord offset for a 124-foot chord may not be more than—(inches)
Class 6 track	Curved [1]	½	⅝	1¼
Class 7 track	Curved [1]	½	½	1
Class 8 track	Curved [1]	½	½	¾

Class of track	Track type	The deviation from uniformity of the mid-chord offset for a 31-foot chord may not be more than—(inches)	The deviation from uniformity of the mid-chord offset for a 62-foot chord may not be more than—(inches)	The deviation from uniformity of the mid-chord offset for a 124-foot chord may not be more than—(inches)
Class 9 track	Curved [1]	½	½	¾

[1] Curved track limits shall be applied only when track curvature is greater than 0.25 degree.

(d) For three or more non-overlapping deviations from uniformity in track alinement occurring within a distance equal to five times the specified chord length, each of which exceeds the limits in the following table, each track owner shall maintain the alinement of the track within the limits prescribed for each deviation:

Class of track	The deviation from uniformity of the mid-chord offset for a 31-foot chord may not be more than—(inches)	The deviation from uniformity of the mid-chord offset for a 62-foot chord may not be more than—(inches)	The deviation from uniformity of the mid-chord offset for a 124-foot chord may not be more than—(inches)
Class 6 track	⅜	½	1
Class 7 track	⅜	⅜	⅞
Class 8 track	⅜	⅜	½
Class 9 track	⅜	⅜	½

(e) For purposes of complying with this section, the ends of the chord shall be at points on the gage side of the rail, five-eighths of an inch below the top of the railhead. On tangent track, either rail may be used as the line rail; however, the same rail shall be used for the full length of that tangential segment of the track. On curved track, the line rail is the outside rail of the curve.

12. Section 213.329 is revised to read as follows:

§ 213.329 Curves; elevation and speed limitations.

(a) The maximum elevation of the outside rail of a curve may not be more than 7 inches. The outside rail of a curve may not be lower than the inside rail, except as a result of a deviation as per § 213.331.

(b) All vehicle types requiring qualification under § 213.345 must demonstrate that when stopped on a curve having a maximum uniform elevation of 7 inches, no wheel unloads to a value less than 50 percent of its static weight on level track.

(c) The maximum posted timetable operating speed for each curve is determined by the following formula:

$$V_{max} = \sqrt{\frac{E_a + E_u}{0.0007D}}$$

Where:

V_{max} = Maximum posted timetable operating speed (m.p.h.).

E_a = Actual elevation of the outside rail (inches).[6]

E_u = Qualified cant deficiency [7] (inches) of the vehicle type.

D = Degree of curvature (degrees).[8]

(d) All vehicles are considered qualified for operating on track with a cant deficiency, E_u, not exceeding 3 inches. Table 1 of appendix A to this part is a table of speeds computed in accordance with the formula in paragraph (c) of this section, when E_u equals 3 inches, for various elevations and degrees of curvature.

(e) Each vehicle type must be approved by FRA to operate on track with a qualified cant deficiency, E_u, greater than 3 inches. Each vehicle type must demonstrate compliance with the requirements of either paragraph (e)(1) or (e)(2) of this section.

(1) When positioned on a track with a uniform superelevation equal to the proposed cant deficiency:

(i) No wheel of the vehicle unloads to a value less than 60 percent of its static value on perfectly level track; and

(ii) For passenger cars, the roll angle between the floor of the equipment and the horizontal does not exceed 8.6 degrees; or

(2) When operating through a constant radius curve at a constant speed corresponding to the proposed cant deficiency, and a test plan is submitted and approved by FRA in accordance with § 213.345(e) and (f):

(ii) The steady-state (average) load on any wheel, throughout the body of the curve, is not to be less than 60 percent of its static value on perfectly level track; and

(iii) For passenger cars, the steady-state (average) lateral acceleration measured on the floor of the carbody does not exceed 0.15g.

(f) The track owner or railroad shall transmit the results of the testing specified in paragraph (e) of this section to FRA requesting approval for the vehicle type to operate at the desired speeds allowed under the formula in paragraph (c) of this section. The request shall be in writing and shall contain, at a minimum, the following information—

(1) A description of the vehicle type involved, including schematic diagrams of the suspension system(s) and the estimated location of the center of gravity above top of rail;

(2) The test procedure [9] and description of the instrumentation used to qualify the vehicle and the maximum values for wheel unloading and roll angles or accelerations that were observed during testing; and

(3) For vehicle types not subject to part 238 or part 229 of this chapter, procedures or standards in effect that relate to the maintenance of all safety-critical components of the suspension system(s) for the particular vehicle type.

[6] Actual elevation, E_a, for each 155-foot track segment in the body of the curve is determined by averaging the elevation for 11 points through the segment at 15.5-foot spacing. If the curve length is less than 155 feet, average the points through the full length of the body of the curve.

[7] If the actual elevation, E_a, and degree of curvature, D, change as a result of track degradation, then the actual cant deficiency for the maximum posted timetable operating speed, Vmax, may be greater than the qualified cant deficiency, E_u. This actual cant deficiency for each curve may not exceed the qualified cant deficiency, E_u, plus one-half inch.

[8] Degree of curvature, D, is determined by averaging the degree of curvature over the same track segment as the elevation.

[9] The test procedure may be conducted whereby all the wheels on one side (right or left) of the vehicle are raised to the proposed cant deficiency and lowered, and then the vertical wheel loads under each wheel are measured and a level is used to record the angle through which the floor of the vehicle has been rotated.

Safety-critical components of the suspension system are those that impact or have significant influence on the roll of the carbody and the distribution of weights on the wheels.

(g) Upon FRA approval of the request, the track owner or railroad shall notify FRA's Associate Administrator for Railroad Safety/Chief Safety Officer in writing no less than 30 calendar days prior to the proposed implementation of the approved higher curving speeds allowed under the formula in paragraph (c) of this section. The notification shall contain, at a minimum, identification of the track segment(s) on which the higher curving speeds are to be implemented. In approving the request in paragraph (f) of this section, FRA may impose conditions necessary for safely operating at the higher curving speeds.

(h) A track owner or railroad that provides passenger or commuter service over trackage of more than one track owner with the same vehicle type may provide written notification to FRA with the written consent of the other affected track owners.

(i) Vehicle types that have been permitted by FRA to operate at cant deficiencies, E_u, shall be considered qualified under this section to operate at those permitted cant deficiencies over the previously operated track segment(s).

(j) As used in this section and in §§ 213.333 and 213.345—

(1) *Vehicle* means a locomotive, as defined in § 229.5 of this part; a freight car, as defined in § 215.5 of this part; a passenger car, as defined in § 238.5 of this part; and any rail rolling equipment used in a train with either a freight car or a passenger car.

(2) *Vehicle type* means vehicles with variations in their physical properties, such as suspension, mass, interior arrangements, and dimensions that do not result in significant changes to their dynamic characteristics.

13. Section 213.331 is revised to read as follows:

§ 213.331 Track surface.

(a) For a single deviation in track surface, each track owner shall maintain the surface of its track within the limits prescribed in the following table:

Track surface (inches)	Class of track			
	6	7	8	9
The deviation from uniform[1] profile on either rail at the mid-ordinate of a 31-foot chord may not be more than	1	1	3⁄4	1⁄2
The deviation from uniform profile on either rail at the mid-ordinate of a 62-foot chord may not be more than	1	1	1	3⁄4
Except as provided in paragraph (b) of this section, the deviation from uniform profile on either rail at the mid-ordinate of a 124-foot chord may not be more than	1 3⁄4	1 1⁄2	1 1⁄4	1
The deviation from zero crosslevel at any point on tangent track may not be more than	1	1	1	1
Reverse elevation on curves[3] may not be more than	1⁄2	1⁄2	1⁄2	1⁄2
The difference in crosslevel between any two points less than 62 feet apart may not be more than[2]	1 1⁄2	1 1⁄2	1 1⁄4	1
On curved track,[3] the difference in crosslevel between any two points less than 10 feet apart (short warp) may not be more than	1 1⁄4	1 1⁄8	1	3⁄4

[1] Uniformity for profile is established by placing the midpoint of the specified chord at the point of maximum measurement.

[2] However, to control harmonics on jointed track with staggered joints, the crosslevel differences shall not exceed 1 inch in all of six consecutive pairs of joints, as created by seven low joints. Track with joints staggered less than 10 feet apart shall not be considered as having staggered joints. Joints within the seven low joints outside of the regular joint spacing shall not be considered as joints for purposes of this footnote.

[3] Curved track limits shall be applied only when track curvature is greater than 0.25 degree.

(b) For operations at a qualified cant deficiency, E_u, of more than 5 inches, a single deviation in track surface shall be within the limits prescribed in the following table:

Track surface[4] (inches)	Class of track			
	6	7	8	9
The difference in crosslevel between any two points less than 10 feet apart (short warp) may not be more than	1 1⁄4	1	[3] 1	3⁄4
The deviation from uniform profile on either rail at the mid-ordinate of a 124-foot chord may not be more than	1 1⁄2	1 1⁄4	1 1⁄4	1

[3] For curves with a qualified cant deficiency, E_u, of more than 7 inches, the difference in crosslevel between any two points less than 10 feet apart (short warp) may not be more than three-quarters of an inch.

[4] Curved track surface limits shall be applied only when track curvature is greater than 0.25 degree.

(c) For three or more non-overlapping deviations in track surface occurring within a distance equal to five times the specified chord length, each of which exceeds the limits in the following table, each track owner shall maintain the surface of the track within the limits prescribed for each deviation:

Track surface (inches)	Class of track			
	6	7	8	9
The deviation from uniform profile on either rail at the mid-ordinate of a 31-foot chord may not be more than	3⁄4	3⁄4	1⁄2	3⁄8
The deviation from uniform profile on either rail at the mid-ordinate of a 62-foot chord may not be more than	3⁄4	3⁄4	3⁄4	1⁄2

Track surface (inches)	Class of track			
	6	7	8	9
The deviation from uniform profile on either rail at the mid-ordinate of a 124-foot chord may not be more than	1¼	1	⅞	⅝

14. Section 213.332 is added to read as follows:

§ 213.332 Combined alinement and surface deviations.

(a) This section applies to any curved track where operations are conducted at a qualified cant deficiency, E_u, greater than 5 inches, and to all Class 9 track, either curved or tangent.

(b) For the conditions defined in paragraph (a) of this section, the combination of alinement and surface deviations for the same chord length on the outside rail in a curve and on any of the two rails of a tangent section, as measured by a TGMS, shall comply with the following formula:

$$\frac{3}{4} \times \left| \frac{A_m}{A_L} + \frac{S_m}{S_L} \right| \le 1$$

Where—

A_m = measured alinement deviation from uniformity (outward is positive, inward is negative).

A_L = allowable alinement limit as per § 213.327(c) (always positive) for the class of track.

S_m = measured profile deviation from uniformity (down is positive, up is negative).

S_L = allowable profile limit as per §§ 213.331(a) and 213.331 (b) (always positive) for the class of track.

$$\left| \frac{A_m}{A_L} + \frac{S_m}{S_L} \right| = \text{the absolute (positive) value of the result of } \frac{A_m}{A_L} + \frac{S_m}{S_L}.$$

15. Section 213.333 is amended by revising paragraphs (a),(b)(1) and (b)(2), (c), (h) through (m), and the Vehicle/Track Interaction Safety Limits table to read as follows:

§ 213.333 Automated vehicle inspection systems.

(a) A qualifying Track Geometry Measuring System (TGMS) shall be operated at the following frequency:

(1) For operations at a qualified cant deficiency, E_u, of more than 5 inches on track Classes 1 through 5, at least twice per calendar year with not less than 120 days between inspections.

(2) For track Class 6, at least once per calendar year with not less than 170 days between inspections. For operations at a qualified cant deficiency, E_u, of more than 5 inches on track Class 6, at least twice per calendar year with not less than 120 days between inspections.

(3) For track Class 7, at least twice within any 120-day period with not less than 25 days between inspections.

(4) For track Classes 8 and 9, at least twice within any 60-day period with not less than 12 days between inspections.

(b) * * *

(1) Track geometry measurements shall be taken no more than 3 feet away from the contact point of wheels carrying a vertical load of no less than 10,000 pounds per wheel;

(2) Track geometry measurements shall be taken and recorded on a distance-based sampling interval not exceeding 1 foot; and

* * * * *

(c) A qualifying TGMS shall be capable of measuring and processing the necessary track geometry parameters, at an interval of no more than every 1 foot, to determine compliance with—

(1) For operations at a qualified cant deficiency, E_u, of more than 5 inches on track Classes 1 through 5: § 213.53, Track gage; § 213.55(b), Track alinement; § 213.57, Curves; elevation and speed limitations; § 213.63, Track surface; and § 213.65, Combined alinement and surface deviations.

(2) For track Classes 6 through 9: § 213.323, Track gage; § 213.327, Track alinement; § 213.329, Curves; elevation and speed limitations; § 213.331, Track surface; and for operations at a cant deficiency of more than 5 inches § 213.332, Combined alinement and surface deviations.

* * * * *

(h) For track Classes 8 and 9, a qualifying Gage Restraint Measuring System (GRMS) shall be operated at least once per calendar year with at least 170 days between inspections. The lateral capacity of the track structure shall not permit a Gage Widening Projection (GWP) greater than 0.5 inch.

(i) A GRMS shall meet or exceed minimum design requirements specifying that—

(1) Gage restraint shall be measured between the heads of the rail:

(i) At an interval not exceeding 16 inches;

(ii) Under an applied vertical load of no less than 10 kips per rail; and

(iii) Under an applied lateral load that provides for lateral/vertical load ratio of between 0.5 and 1.25,[10] and a load severity greater than 3 kips but less than 8 kips per rail. Load severity is defined by the formula:

$$S = L - cV$$

Where—

S = Load severity, defined as the lateral load applied to the fastener system (kips).

L = Actual lateral load applied (kips).

c = Coefficient of friction between rail/tie, which is assigned a nominal value of 0.4.

V = Actual vertical load applied (kips), or static vertical wheel load if vertical load is not measured.

(2) The measured gage and load values shall be converted to a GWP as follows:

$$GWP = (LTG - UTG) \times \frac{8.26}{L - 0.258 \times V}$$

Where—

UTG = Unloaded track gage measured by the GRMS vehicle at a point no less than 10 feet from any lateral or vertical load application.

LTG = Loaded track gage measured by the GRMS vehicle at a point no more than 12 inches from the lateral load application.

L = Actual lateral load applied (kips).

V = Actual vertical load applied (kips), or static vertical wheel load if vertical load is not measured.

GWP = Gage Widening Projection, which means the measured gage widening, which is the difference between loaded and unloaded gage, at the applied loads, projected to reference loads of 16,000 pounds of lateral force and 33,000 pounds of vertical force.

[10] GRMS equipment using load combinations developing L/V ratios that exceed 0.8 shall be operated with caution to protect against the risk of wheel climb by the test wheelset.

(j) A vehicle having dynamic response characteristics that are representative of other vehicles assigned to the service shall be operated over the route at the revenue speed profile. The vehicle shall either be instrumented or equipped with a portable device that monitors onboard instrumentation on trains. Track personnel shall be notified when onboard accelerometers indicate a possible track-related problem. The tests shall be conducted at the following frequency, unless otherwise determined by FRA after reviewing the test data required by this subpart:

(1) For operations at a qualified cant deficiency, E_u, of more than 5 inches on track Classes 1 through 6, carbody acceleration shall be monitored at least once each calendar quarter with not less than 25 days between inspections on at least one passenger car of each type that is assigned to the service; and

(2) For operations at track Class 7 speeds, carbody and truck accelerations shall be monitored at least twice within any 60-day period with not less than 12 days between inspections on at least one passenger car of each type that is assigned to the service; and

(3) For operations at track Classes 8 and 9 speeds, carbody acceleration shall be monitored at least four times within any 7-day period with not more than 3 days between inspections on at least one non-passenger and one passenger carrying vehicle of each type that is assigned to the service. Truck acceleration shall be monitored at least twice within any 60-day period with not less than 12 days between inspections on at least one passenger carrying vehicle of each type that is assigned to the service.

(k)(1) The instrumented vehicle or the portable device, as required in paragraph (j) of this section, shall monitor vertical and lateral accelerations. The accelerometers shall be placed on the floor of the vehicle as near the center of a truck as practicable.

(2) In addition, a device for measuring lateral accelerations shall be mounted on a truck frame at a longitudinal location as close as practicable to an axle's centerline (either outside axle for trucks containing more than 2 axles), or, if approved by FRA, at an alternate location. After monitoring this data for 2 years, or 1 million miles, whichever occurs first, the track owner or railroad may petition FRA for exemption from this requirement.

(3) If any of the carbody lateral, carbody vertical, or truck frame lateral acceleration safety limits in this section's table of vehicle/track interaction safety limits is exceeded, appropriate speed restrictions shall be applied until corrective action is taken.

(l) For track Classes 8 and 9, the track owner or railroad shall submit a report to FRA, once each calendar year, which provides an analysis of the monitoring data collected in accordance with paragraphs (j) and (k) of this section. Based on a review of the report, FRA may require that an instrumented vehicle having dynamic response characteristics that are representative of other vehicles assigned to the service be operated over the track at the revenue speed profile. The instrumented vehicle shall be equipped to measure wheel/rail forces. If any of the wheel/rail force limits in this section's table of vehicle/track interaction safety limits is exceeded, appropriate speed restrictions shall be applied until corrective action is taken.

(m) The track owner or railroad shall maintain a copy of the most recent exception printouts for the inspections required under paragraphs (j), (k), and (l) of this section, as appropriate.

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Vehicle/Track Interaction Safety Limits

Wheel-Rail Forces [1]			
Parameter	**Safety Limit**	**Filter/ Window**	**Requirements**
Single Wheel Vertical Load Ratio	≥ 0.15	5 ft	No wheel of the vehicle shall be permitted to unload to less than 15% of the static vertical wheel load for 5 or more continuous feet. The static vertical wheel load is defined as the load that the wheel would carry when stationary on level track.
Single Wheel L/V Ratio	$\leq \frac{\tan(\delta) - 0.5}{1 + 0.5\tan(\delta)}$	5 ft	The ratio of the lateral force that any wheel exerts on an individual rail to the vertical force exerted by the same wheel on the rail shall not be greater than the safety limit calculated for the wheel's flange angle (δ) for 5 or more continuous feet.
Net Axle Lateral L/V Ratio	$\leq 0.4 + \frac{5.0}{Va}$	5 ft	The net axle lateral force, in kips, exerted by any axle on the track shall not exceed a total of 5 kips plus 40% of the static vertical load that the axle exerts on the track for 5 or more continuous feet. Va = static vertical axle load (kips)
Truck Side L/V Ratio	≤ 0.6	5 ft	The ratio of the lateral forces that the wheels on one side of any truck exert on an individual rail to the vertical forces exerted by the same wheels on that rail shall not be greater than 0.6 for 5 or more continuous feet.

Carbody Accelerations [2]			
Parameter	**Passenger Cars**	**Other Vehicles**	**Requirements**
Carbody Lateral (Transient)	≤ 0.65g peak-to-peak 1 sec window[3]	≤ 0.75g peak-to-peak 1 sec window[3]	The peak-to-peak accelerations, measured as the algebraic difference

	excludes peaks < 50 msec	excludes peaks < 50 msec	between the two extreme values of measured acceleration in any 1-second time period, excluding any peak lasting less than 50 milliseconds, shall not exceed 0.65g and 0.75g for passenger cars and other vehicles, respectively.
Carbody Lateral (Sustained Oscillatory)	≤ 0.10g RMS_t[4] 4 sec window[3] 4 sec sustained	≤ 0.12g RMS_t[4] 4 sec window[3] 4 sec sustained	Sustained oscillatory lateral acceleration of the carbody shall not exceed the prescribed (root mean squared) safety limits of 0.10g and 0.12g for passenger cars and other vehicles, respectively. Root mean squared values are to be determined over a sliding 4- second window with linear trend removed and shall be sustained for more than 4 seconds.
Carbody Vertical (Transient)	≤ 1.0g peak-to-peak 1 sec window[3] excludes peaks < 50 msec	≤ 1.0g peak-to-peak 1 sec window[3] excludes peaks < 50 msec	The peak-to-peak accelerations, measured as the algebraic difference between the two extreme values of measured acceleration in any one second time period, excluding any peak lasting less than 50 milliseconds, shall not exceed 1.0g.
Carbody Vertical (Sustained Oscillatory)	≤ 0.25g RMS_t[4] 4 sec window[3] 4 sec sustained	≤ 0.25g RMS_t[4] 4 sec window[3] 4 sec sustained	Sustained oscillatory vertical acceleration of the carbody shall not exceed the prescribed (root mean squared) safety limit of 0.25g. Root mean squared values are to be determined over a sliding 4-second window with linear trend removed and shall be sustained for more than 4 seconds.

Truck Lateral Acceleration[5]			
Parameter	**Safety Limit**	**Filter/ Window**	**Requirements**
Truck Lateral Acceleration	≤ 0.30g RMS_t[4]	2 sec window[3] 2 sec sustained	Truck hunting shall not develop below the maximum authorized speed. Truck hunting is defined as a sustained cyclic oscillation of the truck evidenced by lateral accelerations exceeding 0.3g root mean squared for more than 2 seconds. Root mean squared values are to be determined over a sliding 2-second window with linear trend removed.

[1] The lateral and vertical wheel forces shall be measured and processed through a low pass filter (LPF) with a minimum cut-off frequency of 25 Hz. The sample rate for wheel force data shall be at least 250 samples per second.

[2] Carbody accelerations in the vertical and lateral directions shall be measured by accelerometers oriented and located in accordance with § 213.333(k).

[3] Acceleration measurements shall be processed through an LPF with a minimum cut-off frequency of 10 Hz. The sample rate for acceleration data shall be at least 100 samples per second.

[4] RMS_t = RMS with linear trend removed.

[5] Truck lateral acceleration shall be measured on the truck frame by accelerometers oriented and located in accordance with § 213.333(k).

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16. Section 213.345 is revised to read as follows:

§ 213.345 Vehicle/track system qualification.

(a) *General.* All vehicle types intended to operate at track Class 6 speeds or above or at any curving speed producing more than 5 inches of cant deficiency shall be qualified for operation for their intended track classes in accordance with this subpart. A qualification program shall be used to ensure that the vehicle/track system will not exceed the wheel/rail force safety limits and the carbody and truck acceleration criteria specified in § 213.333—

(1) At any speed up to and including 5 m.p.h. above the proposed maximum operating speed; and

(2) On track meeting the requirements for the class of track associated with the proposed maximum operating speed. For purposes of qualification testing, speeds that are up to 5 m.p.h. in excess of the maximum allowable speed for each class are permitted.

(b) *Existing vehicle type qualification.* Vehicle types previously qualified or permitted to operate at track Class 6 speeds or above or at any curving speeds producing more than 5 inches of cant deficiency prior to [DATE OF PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER], shall be considered as being successfully qualified under the requirements of this section for operation at the previously operated speeds and cant deficiencies over the previously operated track segment(s).

(c) *New vehicle type qualification.* Vehicle types not previously qualified under this subpart be qualified in accordance with the requirements of this paragraph (c).

(1) *Simulations.* For vehicle types intended to operate at track Class 6 speeds or above, or at any curving speed producing more than 6 inches of cant deficiency, analysis of vehicle/track performance (computer simulations) shall be conducted using an industry recognized methodology on:

(i) An analytically defined track segment representative of minimally compliant track conditions (MCAT—Minimally Compliant Analytical Track) for the respective track classes as specified in appendix D to this part; and

(ii) A track segment representative of the full route on which the vehicle type is intended to operate. Both simulations and physical examinations of the route's track geometry shall be used to determine a track segment representative of the route.

(2) *Carbody acceleration.* For vehicle types intended to operate at track Class 6 speeds or above, or at any curving speed producing more than 5 inches of cant deficiency, qualification testing conducted over a representative segment of the route shall ensure that the vehicle type will not exceed the carbody lateral and vertical acceleration safety limits specified in § 213.333.

(3) *Truck lateral acceleration.* For vehicle types intended to operate at track Class 6 speeds or above, qualification testing conducted over a representative segment of the route shall ensure that the vehicle type will not exceed the truck lateral acceleration safety limit specified in § 213.333.

(4) *Wheel/rail force measurement.* For vehicle types intended to operate at track Class 7 speeds or above, or at any curving speed producing more than 6 inches of cant deficiency, qualification testing conducted over a representative segment of the route shall ensure that the vehicle type will not exceed the wheel/rail force safety limits specified in § 213.333.

(d) *Previously qualified vehicle types.* Vehicle types previously qualified under this subpart for a track class and cant deficiency on one route may be qualified for operation at the same class and cant deficiency on another route through analysis and testing in accordance with the requirements of this paragraph (d).

(1) *Simulations or wheel/rail force measurement.* For vehicle types intended to operate at track Class 7 speeds or above, or at any curving speed producing more than 6 inches of cant deficiency, simulations or measurement of wheel/rail forces during qualification testing shall ensure that the vehicle type will not exceed the wheel/rail force safety limits specified in § 213.333. Simulations, if conducted, shall be in accordance with paragraph (c)(1) of this section. Measurement of wheel/rail forces, if conducted, shall be performed over a representative segment of the new route.

(2) *Carbody acceleration.* For vehicle types intended to operate at any curving speed producing more than 5 inches of cant deficiency, or at both track Class 6 speeds or above and at any curving speed producing more than 4 inches of cant deficiency, qualification testing conducted over a representative segment of the new route shall ensure that the vehicle type will not exceed the carbody lateral and vertical acceleration safety limits specified in § 213.333.

(3) *Truck lateral acceleration.* For vehicle types intended to operate at track Class 7 speeds or above, simulations or measurement of truck lateral acceleration during qualification testing shall ensure that the vehicle type will not exceed the truck lateral acceleration safety limits specified in § 213.333. Measurement of truck lateral acceleration, if conducted, shall be performed over a representative segment of the new route.

(e) *Qualification test plan.* To obtain the data required to support the qualification program outlined in paragraphs (c) and (d) of this section, the track owner or railroad shall submit a qualification test plan to FRA at least 60 days prior to testing, requesting approval to conduct the test at the desired speeds and cant deficiencies. This test plan shall provide for a test program sufficient to evaluate the operating limits of the track and vehicle type and shall include:

(1) The results of vehicle/track performance simulations as required in this subpart;

(2) Identification of the representative segment of the route for qualification testing;

(3) Consideration of the operating environment during qualification testing, including operating practices and conditions, the signal system, highway-rail grade crossings, and trains on adjacent tracks;

(4) The design wheel flange angle that will be used for the determination of the Single Wheel L/V Ratio safety limit specified in § 213.333;

(5) A target maximum testing speed and a target maximum cant deficiency in accordance with paragraph (a) of this section;

(6) An analysis and description of the signal system and operating practices to govern operations in track Classes 7 through 9, which shall include a statement of sufficiency in these areas for the class of operation; and

(7) When simulations are required as part of vehicle qualification, an analysis showing all simulation results.

(f) *Qualification test.* Upon FRA approval of the qualification test plan, qualification testing shall be conducted in two sequential stages as required in this subpart.

(1) Stage-one testing shall include demonstration of acceptable vehicle dynamic response of the subject vehicle as speeds are incrementally increased—

(i) On a segment of tangent track, from acceptable track Class 5 speeds to the target maximum test speed (when the target speed corresponds to track Class 6 and above operations); and

(ii) On a segment of curved track, from the speeds corresponding to 3 inches of cant deficiency to the maximum target maximum cant deficiency.

(2) When stage-one testing has successfully demonstrated a maximum safe operating speed and cant deficiency, stage-two testing shall commence with the subject equipment over a representative segment of the route as identified in paragraph (e)(2) of this section.

(i) A test run shall be conducted over the route segment at the speed the railroad will request FRA to approve for such service.

(ii) An additional test run shall be conducted at 5 m.p.h. above this speed.

(3) When conducting stage-one and stage-two testing, if any of the monitored safety limits is exceeded, on any segment of track intended for operation at track Class 6 speed or greater, or on any segment of track intended for operation at more than 5 inches of cant deficiency, testing may continue provided the track location(s) where the limits are exceeded are identified and test speeds are limited at the track location(s) until corrective action is taken. Corrective action may include making an adjustment in the track, in the vehicle, or both of these system components. Measurements taken on track segments intended for operations below track Class 6 speeds and at 5 inches of cant deficiency or less are not required to be reported.

(4) Prior to the start of the qualification test program, a qualifying Track Geometry Measuring System (TGMS) specified in § 213.333 shall be operated over the intended route within 30 calendar days prior to the start of the qualification test program.

(g) *Qualification test results.* The track owner or railroad shall submit a report to FRA detailing all the results of the qualification program. When simulations are required as part of vehicle qualification, this report shall include a comparison of simulation predictions to the actual wheel/rail force or acceleration data, or both, recorded during full-scale testing. The report shall be submitted at least 60 days prior to the intended operation of the equipment in revenue service over the route.

(h) Based on the test results and submissions, FRA will approve a maximum train speed and value of cant deficiency for revenue service. FRA may impose conditions necessary for safely operating at the maximum train speed and value of cant deficiency approved.

17. Section 213.355 is revised to read as follows:

§ 213.355 Frog guard rails and guard faces; gage.

The guard check and guard face gages in frogs shall be within the limits prescribed in the following table—

Class of track	Guard check gage	Guard face gage
	The distance between the gage line of a frog to the guard line [1] of its guard rail or guarding face, measured across the track at right angles to the gage line,[2] may not be less than—	The distance between guard lines,[1] measured across the track at right angles to the gage line,[2] may not be more than—
Class 6, 7, 8 and 9 track	4′6½″	4′5″

[1] A line along that side of the flangeway which is nearer to the center of the track and at the same elevation as the gage line.
[2] A line five-eighths of an inch below the top of the center line of the head of the running rail, or corresponding location of the tread portion of the track structure.

18. Appendix A to part 213 is revised to read as follows:

Appendix A to Part 213—Maximum Allowable Curving Speeds

This appendix contains four tables identifying maximum allowing curving speeds based on 3, 4, 5, and 6 inches of unbalance (cant deficiency), respectively.

TABLE 1—THREE INCHES UNBALANCE

[Elevation of outer rail (inches)]

Degree of curvature	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
	Maximum allowable operating speed (m.p.h.)												
0°30′	93	100	107	113	120	125	131	136	141	146	151	156	160
0°40′	80	87	93	98	104	109	113	118	122	127	131	135	139
0°50′	72	77	83	88	93	97	101	106	110	113	117	121	124
1°00′	65	71	76	80	85	89	93	96	100	104	107	110	113
1°15′	59	63	68	72	76	79	83	86	89	93	96	99	101
1°30′	53	58	62	65	69	72	76	79	82	85	87	90	93
1°45′	49	53	57	61	64	67	70	73	76	78	81	83	86
2°00′	46	50	53	57	60	63	65	68	71	73	76	78	80
2°15′	44	47	50	53	56	59	62	64	67	69	71	73	76
2°30′	41	45	48	51	53	56	59	61	63	65	68	70	72
2°45′	39	43	46	48	51	53	56	58	60	62	64	66	68
3°00′	38	41	44	46	49	51	53	56	58	60	62	64	65
3°15′	36	39	42	44	47	49	51	53	55	57	59	61	63
3°30′	35	38	40	43	45	47	49	52	53	55	57	59	61
3°45′	34	37	39	41	44	46	48	50	52	53	55	57	59
4°00′	33	35	38	40	42	44	46	48	50	52	53	55	57
4°30′	31	33	36	38	40	42	44	45	47	49	50	52	53
5°00′	29	32	34	36	38	40	41	43	45	46	48	49	51
5°30′	28	30	32	34	36	38	39	41	43	44	46	47	48
6°00′	27	29	31	33	35	36	38	39	41	42	44	45	46
6°30′	26	28	30	31	33	35	36	38	39	41	42	43	44
7°00′	25	27	29	30	32	34	35	36	38	39	40	42	43
8°00′	23	25	27	28	30	31	33	34	35	37	38	39	40
9°00′	22	24	25	27	28	30	31	32	33	35	36	37	38
10°00′	21	22	24	25	27	28	29	30	32	33	34	35	36
11°00′	20	21	23	24	25	27	28	29	30	31	32	33	34
12°00′	19	20	22	23	24	26	27	28	29	30	31	32	33

TABLE 2—FOUR INCHES UNBALANCE

[Elevation of outer rail (inches)]

Degree of curvature	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
	Maximum allowable operating speed (m.p.h.)												
0°30′	107	113	120	125	131	136	141	146	151	156	160	165	169
0°40′	93	98	104	109	113	118	122	127	131	135	139	143	146
0°50′	83	88	93	97	101	106	110	113	117	121	124	128	131
1°00′	76	80	85	89	93	96	100	104	107	110	113	116	120
1°15′	68	72	76	79	83	86	89	93	96	99	101	104	107
1°30′	62	65	69	72	76	79	82	85	87	90	93	95	98
1°45′	57	61	64	67	70	73	76	78	81	83	86	88	90
2°00′	53	57	60	63	65	68	71	73	76	78	80	82	85
2°15′	50	53	56	59	62	64	67	69	71	73	76	78	80
2°30′	48	51	53	56	59	61	63	65	68	70	72	74	76
2°45′	46	48	51	53	56	58	60	62	64	66	68	70	72

TABLE 2—FOUR INCHES UNBALANCE—Continued

[Elevation of outer rail (inches)]

Degree of curvature	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
3°00′	44	46	49	51	53	56	58	60	62	64	65	67	69
3°15′	42	44	47	49	51	53	55	57	59	61	63	65	66
3°30′	40	43	45	47	49	52	53	55	57	59	61	62	64
3°45′	39	41	44	46	48	50	52	53	55	57	59	60	62
4°00′	38	40	42	44	46	48	50	52	53	55	57	58	60
4°30′	36	38	40	42	44	45	47	49	50	52	53	55	56
5°00′	34	36	38	40	41	43	45	46	48	49	51	52	53
5°30′	32	34	36	38	39	41	43	44	46	47	48	50	51
6°00′	31	33	35	36	38	39	41	42	44	45	46	48	49
6°30′	30	31	33	35	36	38	39	41	42	43	44	46	47
7°00′	29	30	32	34	35	36	38	39	40	42	43	44	45
8°00′	27	28	30	31	33	34	35	37	38	39	40	41	42
9°00′	25	27	28	30	31	32	33	35	36	37	38	39	40
10°00′	24	25	27	28	29	30	32	33	34	35	36	37	38
11°00′	23	24	25	27	28	29	30	31	32	33	34	35	36
12°00′	22	23	24	26	27	28	29	30	31	32	33	34	35

TABLE 3—FIVE INCHES UNBALANCE

[Elevation of outer rail (inches)]

Degree of curvature	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
Maximum allowable operating speed (m.p.h.)													
0°30′	120	125	131	136	141	146	151	156	160	165	169	173	177
0°40′	104	109	113	118	122	127	131	135	139	143	146	150	150
0°50′	93	97	101	106	110	113	117	121	124	128	131	134	137
1°00′	85	89	93	96	100	104	107	110	113	116	120	122	125
1°15′	76	79	83	86	89	93	96	99	101	104	107	110	112
1°30′	69	72	76	79	82	85	87	90	93	95	98	100	102
1°45′	64	67	70	73	76	78	81	83	86	88	90	93	95
2°00′	60	63	65	68	71	73	76	78	80	82	85	87	89
2°15′	56	59	62	64	67	69	71	73	76	78	80	82	84
2°30′	53	56	59	61	63	65	68	70	72	74	76	77	79
2°45′	51	53	56	58	60	62	64	66	68	70	72	74	76
3°00′	49	51	53	56	58	60	62	64	65	67	69	71	72
3°15′	47	49	51	53	55	57	59	61	63	65	66	68	70
3°30′	45	47	49	52	53	55	57	59	61	62	64	65	67
3°45′	44	46	48	50	52	53	55	57	59	60	62	63	65
4°00′	42	44	46	48	50	52	53	55	57	58	60	61	63
4°30′	40	42	44	45	47	49	50	52	53	55	56	58	59
5°00′	38	40	41	43	45	46	48	49	51	52	53	55	56
5°30′	36	38	39	41	43	44	46	47	48	50	51	52	53
6°00′	35	36	38	39	41	42	44	45	46	48	49	50	51
6°30′	33	35	36	38	39	41	42	43	44	46	47	48	49
7°00′	32	34	35	36	38	39	40	42	43	44	45	46	47
8°00′	30	31	33	34	35	37	38	39	40	41	42	43	44
9°00′	28	30	31	32	33	35	36	37	38	39	40	41	42
10°00′	27	28	29	30	32	33	34	35	36	37	38	39	40
11°00′	25	27	28	29	30	31	32	33	34	35	36	37	38
12°00′	24	26	27	28	29	30	31	32	33	34	35	35	36

TABLE 4—SIX INCHES UNBALANCE

[Elevation of outer rail (inches)]

Degree of curvature	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
Maximum allowable operating speed (m.p.h.)													
0°30′	131	136	141	146	151	156	160	165	169	173	177	181	185
0°40′	113	118	122	127	131	135	139	143	146	150	154	157	160
0°50′	101	106	110	113	117	121	124	128	131	134	137	140	143
1°00′	93	96	100	104	107	110	113	116	120	122	125	128	131
1°15′	83	86	89	93	96	99	101	104	107	110	112	115	117
1°30′	76	79	82	85	87	90	93	95	98	100	102	105	107
1°45′	70	73	76	78	81	83	86	88	90	93	95	97	99
2°00′	65	68	71	73	76	78	80	82	85	87	89	91	93
2°15′	62	64	67	69	71	73	76	78	80	82	84	85	87

TABLE 4—SIX INCHES UNBALANCE—Continued

[Elevation of outer rail (inches)]

Degree of curvature	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
2°30′	59	61	63	65	68	70	72	74	76	77	79	81	83
2°45′	56	58	60	62	64	66	68	70	72	74	76	77	79
3°00′	53	56	58	60	62	64	65	67	69	71	72	74	76
3°15′	51	53	55	57	59	61	63	65	66	68	70	71	73
3°30′	49	52	53	55	57	59	61	62	64	65	67	69	70
3°45′	48	50	52	53	55	57	59	60	62	63	65	66	68
4°00′	46	48	50	52	53	55	57	58	60	61	63	64	65
4°30′	44	45	47	49	50	52	53	55	56	58	59	60	62
5°00′	41	43	45	46	48	49	51	52	53	55	56	57	59
5°30′	39	41	43	44	46	47	48	50	51	52	53	55	56
6°00′	38	39	41	42	44	45	46	48	49	50	51	52	53
6°30′	36	38	39	41	42	43	44	46	47	48	49	50	51
7°00′	35	36	38	39	40	42	43	44	45	46	47	48	49
8°00′	33	34	35	37	38	39	40	41	42	43	44	45	46
9°00′	31	32	33	35	36	37	38	39	40	41	42	43	44
10°00′	29	30	32	33	34	35	36	37	38	39	40	41	41
11°00′	28	29	30	31	32	33	34	35	36	37	38	39	39
12°00′	27	28	29	30	31	32	33	34	35	35	36	37	38

19. Appendix D to part 213 is added to read as follows:

Appendix D to Part 213—Minimally Compliant Analytical Track (MCAT) Simulations Used for Qualifying Vehicles To Operate at High Speeds and at High Cant Deficiencies

1. This appendix contains requirements for using computer simulations to comply with the vehicle/track qualification testing requirements specified in subpart G of this part. These simulations shall be performed using a track model containing defined geometry perturbations at the limits that are permitted for a class of track and level of cant deficiency. This track model is known as MCAT, Minimally Compliant Analytical Track. These simulations shall be used to identify vehicle dynamic performance issues prior to service, and demonstrate that a vehicle type is suitable for operation on the track over which it will operate.

2. As specified in § 213.345(c)(1), MCAT shall be used for the qualification of new vehicle types intended to operate at speeds corresponding to Class 6 through Class 9 track, or at any curving speed producing more than 6 inches of cant deficiency. In addition, as specified in § 213.345(d)(1), MCAT may be used to qualify on new routes vehicle types that have previously been qualified on other routes and are intended to operate at speeds corresponding to Class 7 through Class 9 track, or at any curving speed producing more than 6 inches of cant deficiency.

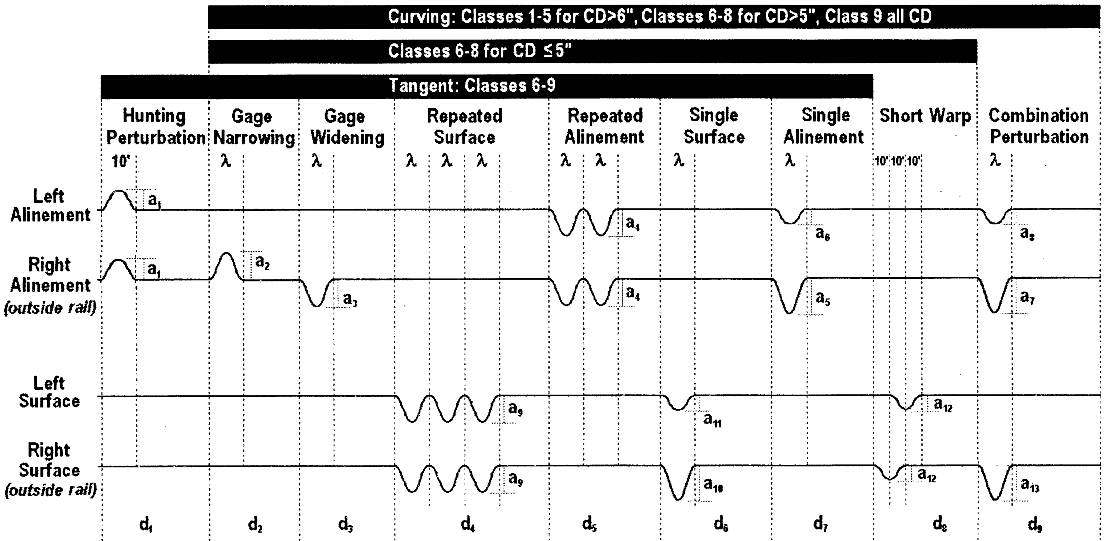
3. For a comprehensive safety evaluation, the track owner or railroad shall identify any non-redundant suspension system element or component that may present a single point of failure. Additional MCAT simulations reflecting the fully-degraded mode of the vehicle type's performance due to such a failure shall be included.

(a) *Validation.* To validate the vehicle model used for MCAT simulations under this part, the track owner or railroad shall obtain vehicle simulation predictions using measured track geometry data, chosen from the same track section over which testing is to be performed as determined by § 213.345(c)(1)(ii). These predictions shall be submitted to FRA in support of the request for approval of the qualification test plan. Full validation of the vehicle model used for MCAT simulations under this part shall be determined when the results of the simulations demonstrate that they replicate all key responses observed during the qualification test.

(b) *MCAT layout.* MCAT consists of nine segments, each designed to test a vehicle's performance in response to a specific type of track perturbation. The basic layout of MCAT is shown in figure 1 of this appendix, by type of track (curving or tangent), class of track, and cant deficiency (CD). The values for wavelength, λ, amplitude of perturbation, a, and segment length, d, are specified in this appendix.

Figure 1 of Appendix D to Part 213

Basic MCAT Layout



(1) *MCAT segments.* MCAT's nine segments contain different types of track deviations in which the shape of each deviation is a versine having wavelength and amplitude varied for each simulation speed as further specified. The nine MCAT segments are defined as follows:

(i) *Hunting perturbation* (a_1): This segment contains an alinement deviation on both rails to test vehicle stability on tangent track having a wavelength, λ, of 10 feet and amplitude of 0.5 inch. This segment is to be used only on tangent track simulations.

(ii) *Gage narrowing* (a_2): This segment contains an alinement deviation on one rail to reduce the gage from the nominal value to the minimum permissible gage or maximum alinement (whichever comes first).

(iii) *Gage widening* (a_3): This segment contains an alinement deviation on one rail to increase the gage from the nominal value to the maximum permissible gage or maximum alinement (whichever comes first).

(iv) *Repeated surface* (a_9): This segment contains three consecutive maximum permissible profile variations on each rail.

(v) *Repeated alinement* (a_4): This segment contains two consecutive maximum permissible alinement variations on each rail.

(vi) *Single surface* (a_{10}, a_{11}): This segment contains a maximum permissible profile variation on one rail. If the maximum permissible profile variation alone produces a condition which exceeds the maximum allowed warp condition, a second profile variation is also placed on the opposite rail to limit the warp to the maximum permissible value.

(vii) *Single alinement* (a_5, a_6): This segment contains a maximum permissible alinement variation on one rail. If the maximum permissible alinement variation alone produces a condition which exceeds the maximum allowed gage condition, a second alinement variation is also placed on the opposite rail to limit the gage to the maximum permissible value.

(viii) *Short warp* (a_{12}): This segment contains a pair of profile deviations to produce a maximum permissible 10-foot warp perturbation. The first is on the outside rail, and the second follows 10 feet farther on the inside rail. Each deviation has a wavelength, λ, of 20 feet and variable amplitude for each simulation speed as described below. This segment is to be used only on curved track simulations.

(ix) *Combination perturbation* (a_7, a_8, a_{13}): This segment contains a maximum permissible down and out combined geometry condition on the outside rail in the body of the curve. If the maximum permissible variations produce a condition which exceeds the maximum allowed gage condition, a second variation is also placed on the opposite rail as for the MCAT segments described in paragraphs (b)(1)(vi) and (vii). This segment is to be used only for curved track simulations at speeds producing more than 5 inches of cant deficiency on track Classes 6 through 9, and at speeds producing more than 6 inches of cant deficiency on track Classes 1 through 5.

(2) *Segment lengths:* Each MCAT segment shall be long enough to allow the vehicle's response to the track deviation(s) to damp out. Each segment shall also have a minimum length as specified in table 1 of this appendix, which references the distances in figure 1 of this appendix. For curved track segments, the perturbations shall be placed far enough in the body of the curve to allow for any spiral effects to damp out.

TABLE 1 OF APPENDIX D TO PART 213—MINIMUM LENGTHS OF MCAT SEGMENTS

Distances (ft)								
d_1	d_2	d_3	d_4	d_5	d_6	d_7	d_8	d_9
1000	1000	1000	1500	1000	1000	1000	1000	1000

(3) *Degree of curvature.* For each simulation involving assessment of curving performance, the degree of curvature, D, which generates a particular level of cant deficiency, E_u, for a given speed, V, shall be calculated using the following equation, which assumes a curve with 6 inches of superelevation:

$$D = \frac{6 + E_u}{0.0007 \times V^2}$$

Where:

D = Degree of curvature (degrees).
V = Simulation speed (m.p.h).
E_u = Cant deficiency (inches).

(c) *Required simulations.*

(1) To develop a comprehensive assessment of vehicle performance, simulations shall be performed for a variety of scenarios using MCAT. These simulations shall be performed to assess performance on tangent or curved track, or both, depending on the level of cant deficiency and speed (track class) as shown in table 2 of this appendix.

TABLE 2 OF APPENDIX D TO PART 213

[Required Vehicle Performance Assessment Using MCAT]

	New vehicle types on track classes 1 through 5 and previously qualified vehicle types on track classes 1 through 6	New vehicle types on track classes 6 through 8 and previously qualified vehicle types on track classes 7 and 8
Curved track: cant deficiency ≤ 6 inches	No simulation required	MCAT—performance on curve.
Curved track: cant deficiency > 6 inches	MCAT—performance on curve	MCAT—performance on curve.
Tangent track	No simulation required	MCAT—performance on tangent.

(i) All simulations shall be performed using the design wheel profile and a nominal track gage of 56.5 inches, using tables 3, 4, 5, or 6 of this appendix, as appropriate. In addition, all simulations involving the assessment of curving performance shall be repeated using a nominal track gage of 57.0 inches, using tables 4, 5, or 6 of this appendix, as appropriate.

(ii) If the running profile is different than APTA 340 or APTA 320, then all simulations shall be repeated using either the APTA 340 or the APTA 320 wheel profile, depending on the established conicity that is common for the operation. In lieu of these profiles, an alternative worn wheel profile may be used if approved by FRA.

(iii) All simulations shall be performed using a wheel/rail coefficient of friction of 0.5.

(2) *Vehicle performance on tangent track Classes 6 through 9.* For maximum vehicle speeds corresponding to track Class 6 and higher, the MCAT segments described in paragraphs (b)(1)(i) through (b)(1)(vii) of this appendix shall be used to assess vehicle performance on tangent track. A parametric matrix of MCAT simulations shall be performed using the following range of conditions:

(i) *Vehicle speed.* Simulations shall ensure that at up to 5 m.p.h. above the proposed maximum operating speed, the vehicle type shall not exceed the wheel/rail force and acceleration criteria defined in the Vehicle/Track Interaction Safety Limits table in § 213.333. Simulations shall be performed to demonstrate acceptable vehicle dynamic response by incrementally increasing speed from 95 m.p.h. (115 m.p.h. if a previously qualified vehicle type on an untested route) to 5 m.p.h. above the proposed maximum operating speed (in 5 m.p.h. increments).

(ii) *Perturbation wavelength.* For each speed, a set of three separate MCAT simulations shall be performed. In each MCAT simulation, every perturbation shall have the same wavelength. The following three wavelengths, λ, are to be used: 31, 62, and 124 feet.

(iii) *Amplitude parameters.* Table 3 of this appendix provides the amplitude values for the MCAT segments described in paragraphs (b)(1)(i) through (b)(1)(vii) of this appendix for each speed of the required parametric MCAT simulations. The last set of simulations shall be performed at 5 m.p.h. above the proposed maximum operating speed using the amplitude values in table 3 that correspond to the proposed maximum operating speed. For qualification of vehicle types involving speeds greater than track Class 6, the following additional simulations shall be performed:

(A) For vehicle types being qualified for track Class 7 speeds, one additional set of simulations shall be performed at 115 m.p.h. using the track Class 6 amplitude values in table 3 (*i.e.,* a 5 m.p.h. overspeed on Class 6 track).

(B) For vehicle types being qualified for track Class 8 speeds, two additional sets of simulations shall be performed. The first set at 115 m.p.h. using the track Class 6 amplitude values in table 3 (*i.e.,* a 5 m.p.h. overspeed on Class 6 track) and a second set at 130 m.p.h. using the track Class 7 amplitude values in table 3 (*i.e.,* a 5 m.p.h. overspeed on Class 7 track).

(C) For vehicle types being qualified for track Class 9 speeds, three additional sets of simulations shall be performed. The first set at 115 m.p.h. using the track Class 6 amplitude values in table 3 (*i.e.,* a 5 m.p.h. overspeed on Class 6 track), a second set at 130 m.p.h. using the track Class 7 amplitude values in table 3 (*i.e.,* a 5 m.p.h. overspeed on Class 7 track), and a third set at 165 m.p.h. using the track Class 8 amplitude values in table 3 (*i.e.,* a 5 m.p.h. overspeed on Class 8 track).

Table 3 of Appendix D to Part 213

Track Class 6 through 9 Amplitude Parameters in inches

for MCAT Simulations on Tangent Track

		Standard Gage (56.5")			
		Class 6	Class 7	Class 8	Class 9
λ = 31 ft	a_1	0.500	0.500	0.500	0.500
	a_2	0.500	0.500	0.500	0.250
	a_3	0.500	0.500	0.500	0.500
	a_4	0.375	0.375	0.375	0.375
	a_5	0.500	0.500	0.500	0.500
	a_6	0.000	0.000	0.000	0.000
	a_9	0.750	0.750	0.500	0.375
	a_{10}	1.000	1.000	0.750	0.500
	a_{11}	0.000	0.000	0.000	0.000
λ = 62 ft	a_1	0.500	0.500	0.500	0.500
	a_2	0.500	0.500	0.500	0.250
	a_3	0.500	0.500	0.500	0.500
	a_4	0.500	0.375	0.375	0.375
	a_5	0.750	0.750	0.750	0.500
	a_6	0.250	0.250	0.250	0.000
	a_9	0.750	0.750	0.750	0.500
	a_{10}	1.000	1.000	1.000	0.750
	a_{11}	0.000	0.000	0.000	0.000
λ = 124 ft	a_1	0.500	0.500	0.500	0.500
	a_2	0.500	0.500	0.500	0.250
	a_3	0.750	0.750	0.750	0.750
	a_4	1.000	0.875	0.500	0.500
	a_5	1.500	1.250	1.000	0.750
	a_6	0.750	0.500	0.250	0.000
	a_9	1.250	1.000	0.875	0.875
	a_{10}	1.750	1.500	1.250	1.000
	a_{11}	0.250	0.000	0.000	0.000

(3) *Vehicle performance on curved Track Classes 6 through 9.* For maximum vehicle speeds corresponding to track Class 6 and higher, the MCAT segments described in paragraphs (b)(1)(ii) through (b)(1)(ix) in this appendix shall be used to assess vehicle performance on curved track. For curves less than 1 degree, simulations must also include the hunting perturbation segment described in paragraph (b)(1)(i) of this appendix. A parametric matrix of MCAT simulations shall be performed using the following range of conditions:

(i) *Vehicle speed.* Simulations shall ensure that at up to 5 m.p.h. above the proposed maximum operating speed, the vehicle type shall not exceed the wheel/rail force and acceleration criteria defined in the Vehicle/Track Interaction Safety Limits table in § 213.333. Simulations shall be performed to demonstrate acceptable vehicle dynamic response by incrementally increasing speed from 95 m.p.h. (115 m.p.h. if a previously qualified vehicle type on an untested route) to 5 m.p.h. above the proposed maximum operating speed (in 5 m.p.h. increments).

(ii) *Perturbation wavelength.* For each speed, a set of three separate MCAT simulations shall be performed. In each MCAT simulation, every perturbation shall have the same wavelength. The following three wavelengths, λ, are to be used: 31, 62, and 124 feet.

(iii) *Track curvature.* For each speed a range of curvatures shall be used to produce cant deficiency conditions ranging from greater than 3 inches up to the maximum intended for qualification (in 1 inch increments). The value of curvature, D, shall be determined using the equation defined in paragraph (a)(3) of this appendix. Each curve shall include representations of the MCAT segments described in paragraphs (b)(1)(ii) through (b)(1)(ix) of this appendix and have a fixed superelevation of 6 inches.

(iv) *Amplitude parameters.* Table 4 of this appendix provides the amplitude values for each speed of the required parametric MCAT simulations for cant deficiencies greater than 3 and less than or equal to 5 inches. Table 5 of this appendix provides the amplitude values for each speed of the required parametric MCAT simulations for cant deficiencies greater than 5 inches. The last set of simulations at the maximum cant deficiency shall be performed at 5 m.p.h. above the proposed maximum operating speed using the amplitude values in table 4 or 5 of this appendix, as appropriate, that correspond to the proposed maximum operating speed and cant deficiency. For these simulations, the value of curvature, D, shall correspond to the proposed maximum operating speed and cant deficiency. For qualification of vehicle types involving speeds greater than track Class 6, the following additional simulations shall be performed:

(A) For vehicle types being qualified for track Class 7 speeds, one additional set of simulations shall be performed at 115 m.p.h. using the track Class 6 amplitude values in table 4 or 5 of this appendix, as appropriate (*i.e.,* a 5 m.p.h. overspeed on Class 6 track) and a value of curvature, D, that corresponds to 110 m.p.h. and the proposed maximum cant deficiency.

(B) For vehicle types being qualified for track Class 8 speeds, two additional set of simulations shall be performed. The first set of simulations shall be performed at 115 m.p.h. using the track Class 6 amplitude values in table 4 or 5 of this appendix, as appropriate (*i.e.,* a 5 m.p.h. overspeed on Class 6 track) and a value of curvature, D, that corresponds to 110 m.p.h. and the proposed maximum cant deficiency. The second set of simulations shall be performed at 130 m.p.h. using the track Class 7 amplitude values in table 4 or 5 of this appendix, as appropriate (*i.e.,* a 5 m.p.h. overspeed on Class 7 track) and a value of curvature, D, that corresponds to 125 m.p.h. and the proposed maximum cant deficiency.

(C) For vehicle types being qualified for track Class 9 speeds, three additional sets of simulations shall be performed. The first set of simulations shall be performed at 115 m.p.h. using the track Class 6 amplitude values in table 4 or 5 of this appendix, as appropriate (*i.e.,* a 5 m.p.h. overspeed on Class 6 track) and a value of curvature, D, that corresponds to 110 m.p.h. and the proposed maximum cant deficiency. The second set of simulations shall be performed at 130 m.p.h. using the track Class 7 amplitude values in table 4 or 5 of this appendix, as appropriate (*i.e.,* a 5 m.p.h. overspeed on Class 7 track) and a value of curvature, D, that corresponds to 125 m.p.h. and the proposed maximum cant deficiency. The third set of simulations shall be performed at 165 m.p.h. using the track Class 8 amplitude values in table 4 or 5 of this appendix, as appropriate (*i.e.,* a 5 m.p.h. overspeed on Class 8 track) and a value of curvature, D, that corresponds to 160 m.p.h. and the proposed maximum cant deficiency.

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Table 4 of Appendix D to Part 213

Track Classes 6 through 9 Amplitude Parameters (in inches)

for MCAT Simulations on Curved Track (Cant Deficiency > 3 and ≤ 5 Inches)

		Standard Gage (56.5")				Wide Gage (57.0")			
		Class 6	Class 7	Class 8	Class 9	Class 6	Class 7	Class 8	Class 9
λ = 31 ft	a_2	0.500	0.500	0.500	0.250	0.500	0.500	0.500	0.500
	a_3	0.500	0.500	0.500	0.500	0.250	0.250	0.250	0.500
	a_4	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375
	a_5	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
	a_6	0.000	0.000	0.000	0.000	0.250	0.250	0.250	0.250
	a_7				0.333				0.333
	a_8				0.000				0.083
	a_9	0.750	0.750	0.500	0.375	0.750	0.750	0.500	0.375
	a_{10}	1.000	1.000	0.750	0.500	1.000	1.000	0.750	0.500
	a_{11}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	a_{12}	0.625	0.563	0.500	0.500	0.625	0.563	0.500	0.500
	a_{13}				0.333				0.333
λ = 62 ft	a_2	0.500	0.500	0.500	0.250	0.500	0.500	0.500	0.500
	a_3	0.500	0.500	0.500	0.500	0.250	0.250	0.250	0.250
	a_4	0.500	0.375	0.375	0.375	0.500	0.375	0.375	0.375
	a_5	0.625	0.500	0.500	0.500	0.625	0.500	0.500	0.500
	a_6	0.125	0.000	0.000	0.000	0.375	0.250	0.250	0.250
	a_7				0.333				0.333
	a_8				0.000				0.083
	a_9	0.750	0.750	0.750	0.500	0.750	0.750	0.750	0.500
	a_{10}	1.000	1.000	1.000	0.750	1.000	1.000	1.000	0.750
	a_{11}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	a_{12}	0.625	0.563	0.500	0.500	0.625	0.563	0.500	0.500
	a_{13}				0.500				0.500
λ = 124 ft	a_2	0.500	0.500	0.500	0.250	1.000	1.000	1.000	0.750
	a_3	0.750	0.750	0.750	0.750	0.250	0.250	0.250	0.250
	a_4	1.000	0.875	0.500	0.500	1.000	0.875	0.500	0.500
	a_5	1.500	1.250	0.750	0.750	1.500	1.250	0.750	0.750
	a_6	0.750	0.500	0.000	0.000	1.250	1.000	0.500	0.500
	a_7				0.500				0.500
	a_8				0.000				0.250
	a_9	1.250	1.000	0.875	0.875	1.250	1.000	0.875	0.875
	a_{10}	1.750	1.500	1.250	1.000	1.750	1.500	1.250	1.000
	a_{11}	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.000
	a_{12}	0.625	0.563	0.500	0.500	0.625	0.563	0.500	0.500
	a_{13}				0.833				0.833

Table 5 of Appendix D to Part 213

Track Class 6 through 9 Amplitude Parameters (in inches)

for MCAT Simulations on Curved Track (Cant Deficiency > 5 Inches)

		Standard Gage (56.5")				Wide Gage (57.0")			
		Class 6	Class 7	Class 8	Class 9	Class 6	Class 7	Class 8	Class 9
λ = 31 ft	a_2	0.500	0.500	0.500	0.250	0.500	0.500	0.500	0.500
	a_3	0.500	0.500	0.500	0.500	0.250	0.250	0.250	0.500
	a_4	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375
	a_5	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
	a_6	0.000	0.000	0.000	0.000	0.250	0.250	0.250	0.250
	a_7	0.333	0.333	0.333	0.333	0.333	0.333	0.333	0.333
	a_8	0.000	0.000	0.000	0.000	0.083	0.083	0.083	0.083
	a_9	0.750	0.750	0.500	0.375	0.750	0.750	0.500	0.375
	a_{10}	1.000	1.000	0.750	0.500	1.000	1.000	0.750	0.500
	a_{11}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	a_{12}	0.625	0.500	0.500[1]	0.500[1]	0.625	0.500	0.500[1]	0.500[1]
	a_{13}	0.667	0.667	0.500	0.333	0.667	0.667	0.500	0.333
λ = 62 ft	a_2	0.500	0.500	0.500	0.250	0.500	0.500	0.500	0.500
	a_3	0.500	0.500	0.500	0.500	0.250	0.250	0.250	0.250
	a_4	0.500	0.375	0.375	0.375	0.500	0.375	0.375	0.375
	a_5	0.625	0.500	0.500	0.500	0.625	0.500	0.500	0.500
	a_6	0.125	0.000	0.000	0.000	0.375	0.250	0.250	0.250
	a_7	0.417	0.333	0.333	0.333	0.417	0.333	0.333	0.333
	a_8	0.000	0.000	0.000	0.000	0.167	0.083	0.083	0.083
	a_9	0.750	0.750	0.750	0.500	0.750	0.750	0.750	0.500
	a_{10}	1.000	1.000	1.000	0.750	1.000	1.000	1.000	0.750
	a_{11}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	a_{12}	0.625	0.500	0.500[1]	0.500[1]	0.625	0.500	0.500[1]	0.500[1]
	a_{13}	0.667	0.667	0.667	0.500	0.667	0.667	0.667	0.500
λ = 124 ft	a_2	0.500	0.500	0.500	0.250	1.000	1.000	1.000	0.750
	a_3	0.750	0.750	0.750	0.750	0.250	0.250	0.250	0.250
	a_4	1.000	0.875	0.500	0.500	1.000	0.875	0.500	0.500
	a_5	1.250	1.000	0.750	0.750	1.250	1.000	0.750	0.750
	a_6	0.500	0.250	0.000	0.000	1.000	0.750	0.500	0.500
	a_7	0.833	0.667	0.500	0.500	0.833	0.667	0.500	0.500
	a_8	0.083	0.000	0.000	0.000	0.583	0.417	0.250	0.250
	a_9	1.250	1.000	0.875	0.875	1.250	1.000	0.875	0.875
	a_{10}	1.500	1.250	1.250	1.000	1.500	1.250	1.250	1.000
	a_{11}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	a_{12}	0.625	0.500	0.500[1]	0.500[1]	0.625	0.500	0.500[1]	0.500[1]
	a_{13}	1.000	0.833	0.833	0.667	1.000	0.833	0.833	0.667

[1] 0.375 for CD>7"

(4) *Vehicle performance on curved track Classes 1 through 5 at high cant deficiency.* For maximum vehicle speeds corresponding to track Classes 1 through 5, the MCAT segments described in paragraphs (b)(1)(ii) through (b)(1)(ix) of this appendix shall be used to assess vehicle performance on curved track if the proposed maximum cant deficiency is greater than 6 inches. For curves less than 1 degree, simulations must also include the hunting perturbation segment described in paragraph (b)(1)(i) of this appendix. A parametric matrix of MCAT simulations shall be performed using the following range of conditions:

(i) *Vehicle speed.* Simulations shall ensure that at up to 5 m.p.h. above the proposed maximum operating speed, the vehicle shall not exceed the wheel/rail force and acceleration criteria defined in the Vehicle/Track Interaction Safety Limits table in § 213.333. Simulations shall be performed to demonstrate acceptable vehicle dynamic response at 5 m.p.h. above the proposed maximum operating speed.

(ii) *Perturbation wavelength.* For each speed, a set of two separate MCAT simulations shall be performed. In each MCAT simulation, every perturbation shall have the same wavelength. The following two wavelengths, λ, are to be used: 31 and 62 feet.

(iii) *Track curvature.* For a speed corresponding to 5 m.p.h. above the proposed maximum operating speed, a range of curvatures shall be used to produce cant deficiency conditions ranging from 6 inches up to the maximum intended for qualification (in 1 inch increments). The value of curvature, D, shall be determined using the equation in paragraph (a)(3) of this appendix. Each curve shall contain the MCAT segments described in paragraphs (b)(1)(ii) through (b)(1)(ix) of this appendix and have a fixed superelevation of 6 inches.

(iv) *Amplitude parameters.* Table 6 of this appendix provides the amplitude values for the MCAT segments described in paragraphs (b)(1)(i) through (b)(1)(vii) of this appendix for each speed of the required parametric MCAT simulations.

Table 6 of Appendix D to Part 213

Track Class 1 through 5 Amplitude Parameters (in inches)

for MCAT Simulations on Curved Track (Cant Deficiency > 6 Inches)

		Standard Gage (56.5")					Wider Gage (57.0")				
		Class 1	Class 2	Class 3	Class 4	Class 5	Class 1	Class 2	Class 3	Class 4	Class 5
λ = 31 ft	a_2	0.500	0.500	0.500	0.500	0.500	1.250	1.250	1.250	0.500	0.500
	a_3	1.250	1.250	1.250	0.500	0.500	0.750	0.750	0.750	0.500	0.500
	a_4	0.750	0.750	0.750	0.750	0.500	0.750	0.750	0.750	0.750	0.500
	a_5	0.750	0.750	0.750	0.750	0.500	0.750	0.750	0.750	0.750	0.500
	a_6	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.000
	a_7	0.500	0.500	0.500	0.500	0.333	0.500	0.500	0.500	0.500	0.333
	a_8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	a_9	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	a_{10}	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	a_{11}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	a_{12}	1.000	1.000	0.875	0.875	0.750	1.000	1.000	0.875	0.875	0.750
	a_{13}	0.667	0.667	0.667	0.667	0.667	0.667	0.667	0.667	0.667	0.667
λ = 62 ft	a_2	0.500	0.500	0.500	0.500	0.500	1.250	1.250	1.250	0.500	0.500
	a_3	1.250	1.250	1.250	0.500	0.500	0.750	0.750	0.750	0.500	0.500
	a_4	1.250	1.250	1.250	0.875	0.625	1.250	1.250	1.250	0.875	0.625
	a_5	1.250	1.250	1.250	0.875	0.625	1.250	1.250	1.250	0.875	0.625
	a_6	0.000	0.000	0.000	0.375	0.125	0.500	0.500	0.500	0.375	0.125
	a_7	0.833	0.833	0.833	0.583	0.417	0.833	0.833	0.833	0.583	0.417
	a_8	0.000	0.000	0.000	0.083	0.000	0.083	0.083	0.083	0.083	0.000
	a_9	1.750	1.750	1.750	1.250	1.000	1.750	1.750	1.750	1.250	1.000
	a_{10}	1.750	1.750	1.750	1.250	1.000	1.750	1.750	1.750	1.250	1.000
	a_{11}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	a_{12}	1.000	1.000	0.875	0.875	0.750	1.000	1.000	0.875	0.875	0.750
	a_{13}	1.167	1.167	1.167	0.833	0.667	1.167	1.167	1.167	0.833	0.667

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PART 238—[AMENDED]

20. The authority citation for part 238 continues to read as follows:

Authority: 49 U.S.C. 20103, 20107, 20133, 20141, 20302–20303, 20306, 20701–20702, 21301–21302, 21304; 28 U.S.C. 2461, note; and 49 CFR 1.49.

Subpart C—Specific Requirements for Tier I Passenger Equipment

21. Section 238.227 is revised to read as follows:

§ 238.227 Suspension system.

On or after November 8, 1999—

(a) All passenger equipment shall exhibit freedom from truck hunting at all operating speeds. If truck hunting does occur, a railroad shall immediately take appropriate action to prevent derailment. Truck hunting is defined in § 213.333 of this chapter.

(b) Nothing in this section shall affect the requirements of the Track Safety Standards in part 213 of this chapter as they apply to passenger equipment as provided in that part. In particular—

(1) *Pre-revenue service qualification.* All passenger equipment intended for service at speeds greater than 90 mph or at any curving speed producing more than 5 inches of cant deficiency shall demonstrate safe operation during pre-revenue service qualification in accordance with § 213.345 of this chapter and is subject to the requirements of either § 213.57 or § 213.329 of this chapter, as appropriate.

(2) *Revenue service operation.* All passenger equipment intended for service at speeds greater than 90 mph or at any curving speed producing more than 5 inches of cant deficiency is subject to the requirements of § 213.333 of this chapter and either §§ 213.57 or 213.329 of this chapter, as appropriate.

Subpart E—Specific Requirements for Tier II Passenger Equipment

22. Section 238.427 is amended by revising paragraphs (a)(2), (b), and (c), and by removing paragraph (d) to read as follows:

§ 238.427 Suspension system.

(a) * * *

(2) All passenger equipment shall meet the safety performance standards for suspension systems contained in part 213 of this chapter, or alternative standards providing at least equivalent safety if approved by FRA under the provisions of § 238.21. In particular—

(i) *Pre-revenue service qualification.* All passenger equipment shall demonstrate safe operation during pre-revenue service qualification in accordance with § 213.345 of this chapter and is subject to the requirements of § 213.329 of this chapter.

(ii) *Revenue service operation.* All passenger equipment in service is subject to the requirements of §§ 213.329 and 213.333 of this chapter.

(b) *Carbody acceleration.* A passenger car shall not operate under conditions that result in a steady-state lateral acceleration greater than 0.15g, as measured parallel to the car floor inside the passenger compartment. Additional carbody acceleration limits are specified in § 213.333 of this chapter.

(c) *Truck (hunting) acceleration.* Each truck shall be equipped with a permanently installed lateral accelerometer mounted on the truck frame. If truck hunting is detected, the train monitoring system shall provide an alarm to the operator and the train shall be slowed to a speed at least 5 mph less than the speed at which the truck hunting stopped. Truck hunting is defined in § 213.333 of this chapter.

23. Section 238.428 is added to read as follows:

§ 238.428 Overheat sensors.

Overheat sensors for each wheelset journal bearing shall be provided. The sensors may be placed either onboard the equipment or at reasonable intervals along the railroad's right-of-way.

Appendix C to Part 238 [Removed and Reserved]

24. Appendix C to part 238 is removed and reserved.

Issued in Washington, DC, on April 29, 2010.

Joseph C. Szabo,

Administrator.

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