§ 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 demonstrate 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 may exceed the maximum allowable operating speed for the class of track in accordance with the test plan approved by FRA.

(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 March 13, 2013, 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 shall be qualified in accordance with the requirements of this paragraph (c).

(1) Simulations or measurement of wheel/rail forces. For vehicle types intended to operate at track Class 6 speeds, simulations or measurement of wheel/rail forces during qualification testing shall demonstrate 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)(2) of this section. Measurement of wheel/rail forces, if conducted, shall be performed over a representative segment of the full route on which the vehicle type is intended to operate.

(2) Simulations. 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, analysis of vehicle/track performance (computer simulations) shall be conducted using an industry recognized methodology.

(i) An analytically defined track segment representative of minimally compliant track conditions (MCAT—Minimally Compliant Analytical Track) for the respective track class(es) 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.

(3) 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 demonstrate that the vehicle type will not exceed the carbody lateral and vertical acceleration safety limits specified in § 213.333.

(4) 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 demonstrate that the vehicle type will not exceed the truck lateral acceleration safety limit specified in § 213.333.

(5) Measurement of wheel/rail forces. 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 demonstrate 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 or testing, or both, to demonstrate compliance with
paragraph (a) of this section in accordance with the following:

(1) **Simulations or measurement of wheel/rail forces.** For vehicle types intended to operate at any curving speed producing more than 6 inches of cant deficiency, or at curving speeds that both correspond to track Class 7 speeds or above and produce more than 5 inches of cant deficiency, simulations or measurement of wheel/rail forces during qualification testing shall demonstrate 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)(2) 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 track Class 7 speeds and above, qualification testing conducted over a representative segment of the new route shall demonstrate 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, measurement of truck lateral acceleration during qualification testing shall demonstrate 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 testing 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 testing plan to FRA’s Associate Administrator for Railroad Safety/Chief Safety Officer (FRA) at least 60 days prior to testing, requesting approval to conduct the testing 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) Identification of the representative segment of the route for qualification testing;

(2) 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;

(3) The maximum angle found on the gage face of the designed (newly-profiled) wheel flange referenced with respect to the axis of the wheelset that will be used for the determination of the Single Wheel L/V Ratio safety limit specified in §213.333;

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

(5) 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

(6) The results of vehicle/track performance simulations that are required by this section.

(f) **Qualification testing.** Upon FRA approval of the qualification testing 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 testing 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)(1) of this section.

(i) A test run shall be conducted over the route segment at the speed the
§ 213.347 Automotive or railroad crossings at grade.

(a) There shall be no at-grade (level) highway crossings, public or private, or rail-to-rail crossings at-grade on Class 8 and 9 track.

(b) If train operation is projected at Class 7 speed for a track segment that will include rail-highway grade crossings, the track owner shall submit for FRA’s approval a complete description of the proposed warning/barrier system to address the protection of highway traffic and high speed trains. Trains shall not operate at Class 7 speeds over any track segment having highway-rail grade crossings unless:
   (1) An FRA-approved warning/barrier system exists on that track segment; and
   (2) All elements of that warning/barrier system are functioning.

§ 213.349 Rail end mismatch.

Any mismatch of rails at joints may not be more than that prescribed by the following table—

<table>
<thead>
<tr>
<th>Class of track</th>
<th>Any mismatch of rails at joints may not be more than the following—</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>On the tread of the rail ends (inch)</td>
</tr>
<tr>
<td>Class 6, 7, 8 and 9</td>
<td>⅛</td>
</tr>
</tbody>
</table>

§ 213.351 Rail joints.

(a) Each rail joint, insulated joint, and compromise joint shall be of a structurally sound design and dimensions for the rail on which it is applied.

(b) If a joint bar is cracked, broken, or because of wear allows excessive vertical movement of either rail when all bolts are tight, it shall be replaced.

(c) If a joint bar is cracked or broken between the middle two bolt holes it shall be replaced.

(d) Each rail shall be bolted with at least two bolts at each joint.

(e) Each joint bar shall be held in position by track bolts tightened to allow the joint bar to firmly support the abutting rail ends and to allow longitudinal movement of the rail in the joint

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 speeds or greater, or on any segment of track intended for operation at more than 5 inches of cant deficiency, testing may continue provided that the track location(s) where any of the limits is exceeded be identified and test speeds be 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 testing program, a qualifying TGMS specified in § 213.333 shall be operated over the intended route within 30 calendar days prior to the start of the qualification testing program.

(g) Qualification testing 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 all other required submissions, FRA will approve a maximum train speed and value of cant deficiency for revenue service, normally within 45 days of receipt of all the required information. FRA may impose conditions necessary for safely operating at the maximum approved train speed and cant deficiency.

(i) The documents required by this section must be provided to FRA by:
   (1) The track owner; or
   (2) A railroad that provides service with the same vehicle type over track

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