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[This document contains strawman text of selected, potential amendments to the Passenger Equipment Safety Standards. Among other things, these amendments are intended to make the operating speeds for the Tier II safety standards consistent with those for Class 8 track in FRA’s Track Safety Standards (§ 213.307), and also add Tier III safety standards for crashworthiness and occupant protection. These amendments are being provided in draft form, and not all potential amendments have been included. Nonetheless, this document should help guide the understanding, discussion, and development of regulatory requirements for these safety tiers.]

**The Proposed Rule**

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

**Subpart A—General**

[xx]. Section 238.5 is amended by .....

§ 238.5            Definitions.

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Cab means locomotive cab.

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Tier II means operating at speeds exceeding 125 mph but not exceeding 160 mph.

\*       \*       \*       \*       \*

Tier III means operating in a shared right-of-way at speeds not exceeding 125 mph and in an exclusive right-of-way without grade crossings at speeds exceeding 125 mph but not exceeding 220 mph.

\*       \*       \*       \*       \*

Trainset, Tier I alternative passenger means a trainset consisting of Tier I passenger equipment designed in accordance with the requirements of appendix G to this part.

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Trainset, Tier III means a short-distance or long-distance intercity passenger train that provides service in a shared right-of-way at speeds not exceeding 125 mph and in an exclusive right-of-way without grade crossings at speeds exceeding 125 mph but not exceeding 220 mph.

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[NOTE: Other changes to this Definitions section are anticipated.]

§ 238.111 Pre-revenue service acceptance testing plan.

*[This section will need to be revised, in particular to account for Tier III passenger equipment. At a minimum, Tier III passenger equipment will be subject to at least the same level of review and approval as Tier II passenger equipment.]*

**Subpart C—Specific Requirements for Tier I Passenger Equipment**

[xx]. Section 238.201 is amended by.....

*[This section will need to be revised to provide for FRA review and approval of a Tier I trainset designed in accordance with the alternative requirements of appendix G to this part. At a minimum, sufficient documentation must be provided in advance of placing the trainset in revenue service, demonstrating that the trainset meets the requirements of appendix G. However, the approval process would differ from that for Tier II and Tier III. FRA envisions that such trainsets would be deemed acceptable without further FRA action based on the appropriate submissions to FRA, unless FRA actively stays approval by written notice to the railroad within a specified time and identifies issues for clarification/resolution.]*

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**Subpart E—Specific Requirements for Tier II Passenger Equipment**

[xx]. Section 238.401 is amended by revising the first sentence to read as follows:

§ 238.401 Scope.

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This subpart contains specific requirements for railroad passenger equipment operating at speeds exceeding 125 mph but not exceeding 160 mph. \* \* \*

\* \*

[NOTE: These changes would provide only the authority to operate at speeds up to 160 mph. FRA approval to do so would continue to be required in accordance with this part and other FRA safety regulations.]

**Subpart F—Inspection, Testing, and Maintenance Requirements for Tier II Passenger Equipment**

[xx]. Section 238.501 is amended by revising it to read as follows:

§ 238.501 Scope.

This subpart contains inspection, testing, and maintenance requirements for railroad passenger equipment that operates at speeds exceeding 125 mph but not exceeding 160 mph.

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**Subpart G—Specific Safety Planning Requirements for Tier II Passenger Equipment**

[NOTE: No revision to this subpart is needed to increase Tier II’s maximum operating speed. Yet, there is a need to consider the subpart’s relationship with the system safety rulemaking.]

\* \* \* \* \*

[xx]. Subpart H is added to part 238 to read as follows:

**Subpart H—Specific Requirements for Tier III Passenger Equipment**

Sec.

238.701 Scope.

**TRAINSET STRUCTURE**

238.703 Occupied volume integrity.

- 238.705      Dynamic collision scenario.
- 238.707      Override protection.
- 238.709      Fluid entry inhibition.
- 238.711      End structure integrity of cab end.
- 238.713      End structure integrity of non-cab end.
- 238.715      Roof and side structure integrity.
- 238.717      Truck attachment.

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#### GLAZING

- 238.721      Glazing.

\*      \*      \*      \*      \*

#### BRAKE SYSTEM

- 238.731      Brake system.

\*      \*      \*      \*      \*

#### INTERIOR FITTINGS AND SURFACES

- 238.733      Interior fixture attachment.
- 238.735      Seat crashworthiness (passenger and cab crew).
- 238.737      Luggage racks.

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#### EMERGENCY SYSTEMS

- 238.741      Emergency window egress and rescue access.
- 238.743      Emergency lighting.

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#### CAB EQUIPMENT

238.751 Alerters.

238.753 Sanders.

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Figure 1 to Subpart H—[*Enter title*]

Table 1 to Subpart H—[*Enter title*]

#### **Subpart H—Specific Requirements for Tier III Passenger Equipment**

§ 238.701 Scope.

This subpart contains specific requirements for railroad passenger equipment operating in a shared right-of-way at speeds not exceeding 125 mph and in an exclusive right-of-way without grade crossings at speeds exceeding 125 mph but not exceeding 220 mph. Passenger seating is permitted in the leading and trailing units of a Tier III trainset, provided that safety issues associated with passengers occupying the leading unit are addressed and mitigated through a comprehensive system safety analysis. Demonstration of compliance with the requirements of this subpart is subject to FRA review and approval in accordance with § 238.111.

#### TRAINSET STRUCTURE

§ 238.703 Occupied volume integrity (OVI).

(a) General. To demonstrate resistance to loss of occupied volume, Tier III trainsets shall comply with both the quasi-static compression load requirements in paragraph (b) of this section and the dynamic collision requirements in § 238.705.

(b) Quasi-static compression load requirements.

(1) Each vehicle in a Tier III trainset shall resist a minimum quasi-static end load of either:

(i) 800,000 pounds applied on the collision load path without permanent deformation of the occupied volume; or

(ii) 1,000,000 pounds applied on the collision load path without exceeding either of the following two conditions:

(A) Local plastic strains no greater than 5 percent; and

(B) Vehicle shortening no greater than 1 percent over any 15-foot length of the occupied volume; or

(iii) 1,200,000 pounds applied on the collision load path without crippling the body structure. Crippling of the body structure is defined as reaching the maximum point on the load-versus-displacement characteristic.

(2) The end compression load shall be applied to the vehicle in a manner consistent with the governing design standard, with an end load magnitude no less than 337,000 lbf (1500 kN) regardless of the load magnitude specified by the governing design standard.

(3) Compliance with the requirements of this paragraph shall be documented and submitted to FRA for review and approval.

§ 238.705     Dynamic collision scenario.

(a)     General. In addition to the requirements of § 238.703, OVI shall also be demonstrated for each vehicle in a Tier III trainset through an evaluation of a dynamic collision scenario in which a moving train impacts a standing train under the following conditions:

(1)     The initially-moving train is made up of the equipment undergoing evaluation at its AW0 ready-to-run weight;

(2)     If trains of varying consist lengths are intended for use in service then the configurations having the shortest and longest consist lengths shall be evaluated;

(3)     If the trainset is intended for use in push-pull service then, as applicable, both the locomotive-led and cab-car led configurations shall be evaluated separately;

(4)     The initially-standing train is made up of a rigid locomotive and five identical coaches having the following characteristics:

(i)     The locomotive weighs 260,000 pounds and each coach weighs 95,000 pounds;

(ii)     The locomotive and each coach crush in response to applied force as specified in Table 1 to this subpart; and

(iii)    The locomotive has a geometric design as depicted in Figure 1 to this subpart;

(5)     The scenario shall be evaluated on tangent, level track;

(6)     The initially-moving train shall have an initial velocity of 20 mph if the consist is MU-locomotive or cab car-led, or an initial velocity of 25 mph if the consist is conventional locomotive-led;

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- (7) The coupler knuckles on the impacting equipment shall be closed;
- (8) The moving and standing consists are not braked;
- (9) The standing train has only one degree-of-freedom (longitudinal displacement); and
- (10) The model used to demonstrate the dynamic collision requirements must be validated. Model validation shall be documented and submitted to FRA for review and approval.
  - (b) Dynamic collision requirements. As a result of the impact described in paragraph (a) of this section—
    - (1) One of the following two conditions must be met for the occupied volume:
      - (i) There shall be no more than 10 inches of longitudinal permanent deformation; or
      - (ii) Global vehicle shortening shall not exceed 1 percent over any 15-foot length of occupied volume.
    - (2) A plot of the relative velocity versus relative displacement calculated at the center-of-gravity (CG) of each vehicle, compared with a plot of the relative velocity versus relative displacement, calculated from the crash pulse(s) specified in seat testing in accordance with § 238.735, shall be made available to FRA upon request.
    - (3) Compliance with each of the following conditions shall also be demonstrated for the cab after the impact:
      - (i) Each seat provided for an employee regularly assigned to occupy the cab, and any floor-mounted seat in the cab, shall have a survival space where there is no intrusion for a minimum of 12 in. from each edge of the seat;

- (ii) There shall be a clear exit path for the occupants of the cab;
- (iii) The vertical height of the cab (floor to ceiling) shall not be reduced by more than 20 percent; and
- (iv) The operating console shall not have moved closer to the engineer's seat.

§ 238.707     Override protection.

- (a) Colliding equipment.
  - (1) Using the dynamic impact scenario described in § 238.705(a), anti-climbing performance shall be evaluated for each of the following sets of initial conditions:
    - (i) All vehicles in the moving and standing consists are positioned at their nominal running heights; and
    - (ii) The interface of the colliding equipment is perturbed laterally and vertically by 3 in.
  - (2) For each set of initial conditions specified in paragraph (a)(1) of this section, compliance with the following conditions shall be demonstrated after a dynamic impact:
    - (i) The relative difference in elevation between the underframes of the colliding equipment in the initially-moving and initially-standing consists shall not change by more than 4 in; and
    - (ii) The tread of any wheel of the first vehicle of the initially-moving train shall not rise above the top of rail by more than 4 in.
- (b) Connected equipment override.

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(1) Using the dynamic impact scenario described in § 238.705(a), anti-climbing performance shall be evaluated for each of the following sets of initial conditions:

(i) All vehicles in the moving and standing consists are positioned at their nominal running heights; and

(ii) The first vehicle-to-vehicle interface of the initially-moving consist is perturbed laterally and vertically by 2 in.

(2) For each set of initial conditions specified in paragraph (b)(1) of this section, compliance with the following conditions shall be demonstrated after a dynamic impact:

(i) The relative difference in elevation between the underframes of the connected equipment shall not change by more than 4 in. and

(ii) The tread of any wheel of the initially-moving train shall not rise above the top of rail by more than 4 in.

§ 238.709     Fluid entry inhibition.

(a) The skin covering the forward-facing end of a Tier III trainset shall be—

(1) Equivalent to a ½-inch steel plate with yield strength of 25,000 pounds per square inch. Material of higher yield strength may be used to decrease the required thickness of the material provided at least an equivalent level of strength is maintained. The sum of the thicknesses of elements (e.g., skin and structural elements) between the front of the trainset to just in front of the engineer, when projected onto the plane just in front of the engineer, may also be used to satisfy this requirement;

(2) Designed to inhibit the entry of fluids into the cab; and

(3) Affixed to the collision posts or other main structural members of the forward end structure so as to add to the strength of the end structure.

(b) Information used to demonstrate compliance with the requirements of this section shall at a minimum include a list and drawings of the structural elements considered in satisfying the requirement of this section, as well as calculations showing that the thickness-strength requirement is satisfied.

§ 238.711      End structure integrity of cab end.

To demonstrate the integrity of the end structure at the cab ends of Tier III trainsets, the cab ends of Tier III trainsets shall comply with the requirements of appendix F to this part. For those units of Tier III trainsets without identifiable corner or collision posts, the requirements of appendix F apply to the end structure at the specified locations, whether or not the structure at the specified locations is a post.

§ 238.713      End structure integrity of non-cab end.

(a) General. To demonstrate the integrity of the end structure for other than the cab ends of Tier III trainsets, Tier III trainsets shall comply with the requirements in paragraphs (b) and (c) of this section.

(b) Collision post requirements.

(1) Each unit of a Tier III trainset shall have at each non-cab end of the unit either:

(i) Two full-height collision posts, located at approximately the one-third points laterally. Each collision post shall have an ultimate longitudinal shear strength of

not less than 300,000 pounds at a point even with the top of the underframe member to which it is attached. If reinforcement is used to provide the shear value, the reinforcement shall have full value for a distance of 18 inches up from the underframe connection and then taper to a point approximately 30 inches above the underframe connection; or

(ii) An equivalent end structure that can withstand the sum of forces that each collision post in paragraph (b)(1)(i) of this section is required to withstand. For analysis purposes, the required forces may be assumed to be evenly distributed at the end structure at the underframe joint.

(2) Collision posts are not required for the non-cab ends of any unit with push-back couplers and interlocking anti-climbing mechanisms in a Tier III trainset, or the non-cab ends of a semi-permanently coupled consist of trainset units, provided that the inter-car connection is capable of preventing disengagement and telescoping to the same extent as equipment satisfying the anti-climbing and collision post requirements contained in subpart C of this part. For demonstrating that the inter-car connection is capable of preventing such disengagement (and telescoping), the criteria in § 238.707(b) apply.

(c) Corner post requirements.

(1) Each passenger car in a Tier III trainset shall have at each non-cab end of the car, placed ahead of the occupied volume, two side structures capable of resisting a:

(i) 150,000-pound horizontal force applied at floor height without failure;

(ii) 20,000-pound horizontal force applied at roof height without failure; and

(iii) 30,000-pound horizontal force applied at a point 18 in. above the top of the floor without permanent deformation.

(2) For purposes of this paragraph, the orientation of the applied horizontal forces shall range from longitudinal inward to transverse inward.

(3) For each evaluation load, the load shall be applied to an area of the structure sufficient to not locally cripple or punch through the material.

(4) The load area shall be chosen to be appropriate for the particular car design and shall not exceed 10 inches by 10 inches.

§ 238.715     Roof and side structure integrity.

To demonstrate roof and side structure integrity, Tier III trainsets shall comply with the requirements in §§ 238.215 and 238.217.

§ 238.717     Truck attachment.

To demonstrate the integrity of truck-to-carbody attachments, each unit in a Tier III trainset shall comply with either the requirements of:

(a) Section 238.219; or

(b) Shall have a truck-to-carbody attachment with strength sufficient to resist, without yielding, the following individually applied, quasi-static loads on the mass of the truck at its CG:

(1) 3g vertically downward;

(2) 1g laterally, along with the resulting vertical reaction to this load; and

(3) Except as provided in paragraph (c) of this section, 5g longitudinally, along with the resulting vertical reaction to this load, provided that for the nominal initial conditions in the scenario described in § 238.705(a):

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(i) The average longitudinal deceleration at the CG of the equipment during the impact does not exceed 5g; and

(2) The peak longitudinal deceleration of the truck during the impact does not exceed 10g.

(c) As an alternative to demonstrating compliance with paragraph (b)(3) of this section, the truck shall be shown to remain attached after a dynamic impact under the nominal initial conditions in the scenario described in § 238.705(a).

(d) For purposes of paragraph (b) of this section, the mass of the truck includes axles, wheels, bearings, the truck-mounted brake system, suspension system components, and any other component attached to the truck by design.

(e) Truck attachment shall be demonstrated using a validated model.

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GLAZING

§ 238.721 Glazing.

*[Please note that FRA has temporarily removed all the glazing text from this document except for the provision on non-cab, side-facing glazing, which was tentatively approved by consensus. The Task Force will reexamine requirements for glazing with the assistance of the Tier III Cab-Glazing Task Group (sub-Task Force).]*

\* \* \* \* \*

(e) Non-cab glazing; side-facing.

(1) Except as provided in paragraph (e)(2) of this section, each side-facing exterior window in other than a cab shall comply with the requirements for Type II glazing contained in appendix A to part 223 of this chapter.

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(2) In lieu of the requirements specified in paragraph (e)(1) of this section, a side-facing exterior window intended to be breakable and serve as an emergency window exit may comply with an alternative standard that provides an equivalent level of safety and is approved for use by FRA.

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## BRAKE SYSTEM

*[Note: A “locomotive” is a “locomotive” under Chapter 207 of Title 49, United States Code (49 U.S.C. 20701 et seq.). Nothing in this RSAC effort will change any statutory requirement governing locomotive safety. However, as a general matter and consistent with statutory requirements, existing regulations implementing these requirements can and should be reevaluated for their appropriateness to locomotives operating in a Tier III environment. With this understanding, and generally speaking, requirements for Tier III locomotive safety are intended to be specified in this section and other sections in Part 238, instead of Subparts A through C of Part 229.]*

### § 238.731     Brake system.

(a) General. Each railroad shall demonstrate through analysis and testing the maximum safe operating speed for its Tier III trainsets that results in no thermal damage to equipment or infrastructure during normal operation of the brake system.

(b) Minimum performance requirement for brake system. Each Tier III trainset’s brake system shall be capable of stopping the trainset from its maximum operating speed within the signal spacing existing on the track over which the trainset is operating under the worst-case adhesion conditions as defined in the railroad’s system safety plan.

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(c) Emergency brake system. A Tier III trainset shall be provided with an emergency brake application feature that produces an irretrievable stop. An emergency brake application shall be available at any time, and shall be initiated by an unintentional parting of the trainset and by the train crew at locations specified in the railroad's system safety plan.

(d) Passenger brake alarm.

(1) A means to initiate a passenger brake alarm shall be provided at two locations in each unit of a Tier III trainset; except where a unit of the trainset is 45 feet or less in length, a means to initiate a passenger brake alarm need only be provided at one location in the unit. These locations shall be identified in the railroad's system safety plan. The words "Passenger Brake Alarm" shall be legibly stenciled or marked on each device or on an adjacent badge plate.

(2) All passenger brake alarms shall be installed so as to prevent accidental activation.

(3) During departure from the boarding platform, activation of the passenger brake alarm shall result in an emergency brake application.

(4) A passenger brake alarm activation that occurs after the trainset has safely cleared the boarding platform shall be acknowledged by the engineer within the time period specified in the railroad's system safety plan in order for train operation to remain under the full control of the engineer. The method used to confirm that the trainset has safely cleared the boarding platform shall be defined in the railroad's system safety plan.

(5) If the engineer does not acknowledge the passenger brake alarm as specified in paragraph (d)(4) of this section, at a minimum a retrievable full service brake application

shall be automatically initiated until the trainset has stopped, unless the engineer intervenes as described in paragraph (d)(6) of this section.

(6) To retrieve the full service brake application described in paragraph (d)(5) of this section, the engineer must acknowledge the passenger brake alarm and activate appropriate controls to issue a command for brake application as specified in the railroad's system safety plan.

(e) Degraded brake system performance. The requirements of this paragraph (e) apply to operation of Tier III trainsets with blended braking systems, to address degraded brake system performance:

(1) Loss of power or failure of the dynamic or regenerative brake shall not result in exceeding the allowable stopping distance as defined in the railroad's system safety plan;

(2) The available friction braking shall be adequate to stop the trainset safely under the operating conditions defined in the railroad's system safety plan;

(3) The operational status of the trainset brake system shall be displayed for the engineer in the operating cab; and

(4) The railroad shall demonstrate through analysis and testing the maximum speed for safely operating its Tier III trainsets using only the friction brake portion of the blended brake with no thermal damage to equipment or infrastructure.

(f) Main reservoir system.

(1) The main reservoirs in a Tier III trainset shall be designed and tested to meet the requirements of a recognized standard specified in the railroad's system safety plan, such as the American Society of Mechanical Engineers (ASME) Boiler and Pressure

Vessel Code for Unfired Pressure Vessel Section VIII Division 1 (ASME Code). The working pressure shall be 150 psig (10.3 bar) and the corresponding rated temperature shall be 150°F (65°C) unless otherwise defined in the railroad's system safety plan. Reservoirs shall be certified based on their size and volume requirements.

(2) Each welded steel main reservoir shall be drilled in accordance with the requirements of a recognized standard specified in the railroad's system safety plan, such as the ASME Code, UG-25(e). One row of holes shall be drilled lengthwise on the reservoir on a line intersecting the drain opening with the drain opening located at the low point of the reservoir and sloped to the drain opening.

(3) A breach of a welded steel main reservoir at any of the drilled holes described in paragraph (f)(2) of this section shall be cause for the reservoir to be condemned and withdrawn from service. Any type of welded repair to a steel main reservoir is prohibited.

(g) Aluminum main reservoirs.

(1) Aluminum main reservoirs used in a Tier III trainset shall be designed and fabricated as follows:

(i) The heads and shell shall be made of Aluminum Association Alloy No. 5083-0, produced in accordance with American Society of Mechanical Engineers (ASME) Specification SB-209, as defined in the "ASME Boiler and Pressure Vessel Code" (1971 edition), Section II, Part B, page 123, with a minimum tensile strength of 40,000 p.s.i. (40 k.s.i.).

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- (ii) Each aluminum main reservoir shall be designed and fabricated in accordance with the “ASME Boiler and Pressure Vessel Code,” Section VIII, Division I (1971 edition), except as otherwise provided in this section.
- (iii) An aluminum main reservoir shall be constructed to withstand at least five times its maximum working pressure, or 800 p.s.i., whichever is greater.
- (iv) Each aluminum main reservoir shall have at least two inspection openings to permit complete circumferential visual observation of the interior surface. On reservoirs less than 18 inches in diameter, the size of each inspection opening shall be at least that of 1½ -inch threaded iron pipe, and on reservoirs 18 or more inches in diameter, the size of each opening shall be at least that of 2-inch threaded iron pipe.
- (2) Any type of welded repair to an aluminum main reservoir is prohibited.
- (h) Main reservoir tests. Prior to initial installation, each main reservoir shall be subjected to a pneumatic or hydrostatic pressure test based on the maximum working pressure defined in paragraph (f) and (g) of this section unless otherwise established by the railroad’s mechanical officer. Records of the test date, location, and pressure shall be maintained by the railroad for the life of the equipment. Periodic inspection requirements for main reservoirs shall be defined in the railroad’s inspection, testing, and maintenance (ITM) plan.
- (i) Brake gauges. All mechanical gauges and all devices providing electronic indication of air pressure that are used by the engineer to aid in the control or braking of a Tier III trainset shall be located so that they may be conveniently read from the engineer’s normal position during operation of the trainset.
- (j) Brake application/release.

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(1) Brake actuators shall be designed to provide brake pad and shoe clearance when the brakes are released.

(2) The minimum brake cylinder pressure shall be established to provide adequate adjustment from minimum service to full service for proper train operation. The brake cylinder pressure shall be approved as part of the design review process described in the railroad's system safety plan.

(k) Foundation brake gear. The inspection, testing, and maintenance requirements for the foundation brake gear shall be specified in the railroad's ITM plan.

(l) Leakage.

(1) If a Tier III trainset is equipped with a brake pipe, the leakage rates shall not exceed the limits defined in either paragraph (l)(2) of this section, or those defined in the Air Consumption Analysis included in the railroad's system safety plan, whichever is more restrictive. The method of inspection for main reservoir pipe leakage shall be prescribed in the railroad's ITM plan.

(2) Brake pipe leakage may not exceed 5 p.s.i. per minute; and with a full service application at maximum brake pipe pressure and with communication to the brake cylinders closed, the brakes shall remain applied for at least 5 minutes.

(m) Slide alarm.

(1) A Tier III trainset shall be equipped with an adhesion control system designed to automatically adjust the braking force on each wheel to prevent sliding during braking.

(2) A wheel slide alarm that is visual or audible, or both, shall alert the engineer in the operating cab to wheel-slide conditions on any axle of the trainset.

(3) In the event of a failure of this system to prevent wheel slide within preset parameters as specified in the railroad's system safety plan, operating restrictions for a trainset with slide protection devices that are not functioning as intended shall be specified in the railroad's system safety plan.

(n) Each Tier III trainset shall be equipped with a monitoring and diagnostic system that is designed to automatically assess the functionality of the brake system for the entire trainset. Details of the system operation and the method of communication of brake system functionality prior to the dispatch of the trainset shall be described in detail in the railroad's system safety plan.

(o) Train securement. Each Tier III trainset shall be equipped with a means of securing the equipment, independent of the pneumatic brake, on the grade condition anticipated by the operating railroad. In its system safety plan, the railroad shall specify its procedures to secure the equipment, and shall demonstrate that these procedures effectively secure the equipment.

(p) Rescue operation; brake system. A Tier III trainset's brake system shall be designed so as to allow a rescue vehicle or trainset to control its brakes when the trainset is disabled.

## INTERIOR FITTINGS AND SURFACES

### § 238.733 Interior fixture attachment.

Tier III trainsets shall comply with the interior fixture attachment requirements in either:

(a) Section 6.1.4 , Security of furniture, equipment and features, of Railway Group Standard GM/RT2100, Issue Four, Requirements for Rail Vehicle Structures, Rail Safety and Standards Board Ltd., December 2010, provided that—

(1) The average longitudinal deceleration of the CG of each vehicle during the dynamic collision scenario specified in § 238.705 shall not exceed 5g during any 100-millisecond (ms) period;

(2) Interior fixture attachment strength is based on a minimum of 5g longitudinal, 3g lateral, and 3g vertical acceleration resistance; and

(3) Use of the standard is carried out in accordance with any conditions identified in the railroad's system safety plan, as approved by FRA; or

(b) Section 238.233 and APTA SS-C&S-006, Rev. 1, Standard for Attachment Strength of Interior Fittings for Passenger Railroad Equipment.

§ 238.735     Seat crashworthiness (passenger and cab crew).

(a) Passenger seating in Tier III trainsets shall comply with the requirements in either:

(1) Section 6.2, Seats for passengers, personnel, or train crew, of Railway Group Standard GM/RT2100, Issue Four, Requirements for Rail Vehicle Structures, Rail Safety and Standards Board Ltd., December 2010, provided that—

(i) The average longitudinal deceleration of the CG of each vehicle during the dynamic collision scenario specified in § 238.705 shall not exceed 5g during any 100-ms period;

- (ii) Seat attachment strength is based on a minimum of 5g longitudinal, 3g lateral, and 3g vertical acceleration resistance; and
  - (iii) Use of the standard is carried out in accordance with any conditions identified in the railroad's system safety plan, as approved by FRA; or
- (2) Section 238.233 and APTA SS-C&S-016, Rev. 2, Standard for Passenger Seats in Passenger Rail Cars, excluding Section 6.0, Seat durability testing.
- (b) Each seat provided for an employee regularly assigned to occupy the cab of a Tier III trainset, and any floor-mounted seat in the cab, shall comply with the following:
    - (1) Section 238.233 (e), (f), and (g), including the loading requirements of 8g longitudinal, 4g lateral, and 4g vertical; and
    - (2) The performance, design, and test criteria of AAR-RP-5104, Locomotive Cab Seats, April 2008.

§ 238.737     Luggage racks.

- (a) Overhead storage racks shall provide longitudinal and lateral restraint for stowed articles. These racks shall incorporate transverse dividers at a maximum spacing of 10 ft. (3 m) to restrain the longitudinal movement of luggage. To restrain the lateral movement of luggage, these racks shall also slope downward in the outboard direction at a minimum ratio of 1:8 with respect to a horizontal plane.
- (b) Luggage racks shall comply with the requirements in either:

(1) Section 6.8, Luggage stowage, of Railway Group Standard GM/RT2100, Issue Four, Requirements for Rail Vehicle Structures, Rail Safety and Standards Board Ltd., December 2010, provided that—

(i) The average longitudinal deceleration of the CG of each vehicle during the dynamic collision scenario specified in § 238.705 does not exceed 5g during any 100-ms period; and

(ii) Attachment strength is based on a minimum of 5g longitudinal, 3g lateral, and 3g vertical acceleration resistance; and

(iii) Use of the standard is carried out in accordance with any conditions identified in the railroad's system safety plan, as approved by FRA. In particular, the railroad shall determine the maximum allowable weight of the luggage stowed for purposes of evaluating luggage rack attachment strength; or

(2) Section 238.233.

## EMERGENCY SYSTEMS

*[NOTE: This represents only a portion of the emergency systems provisions that will be applicable to Tier III passenger equipment. All else being equal, Tier III passenger equipment will be subject to the same provisions as required for Tier II passenger equipment.]*

238.741      Emergency window egress and rescue access.

(a) Emergency window egress and rescue access plan. If a passenger car in a Tier III trainset is not designed to comply with the requirements in § 238.113 or § 238.114, the railroad shall submit to FRA for approval an emergency window egress and rescue access plan during the design review stage. The plan must include, but is not limited to, the elements in this section.

(b) Ease of operability. If an emergency window exit in a passenger car requires the use of a tool, other implement (e.g., hammer), or a mechanism to permit removal of the window panel from the inside of the car during an emergency situation, then the plan must demonstrate that the use of such a device provides for a level of safety equivalent to that provided by § 238.113(b). In particular, the plan must address the location, design, and signage and instructions for the device.

(c) Dimensions. If the dimensions of a window opening in a passenger car do not comply with the requirements in § 238.113 or § 238.114, then the plan must demonstrate that at least an equivalent level of safety is provided.

(d) Alternative emergency evacuation openings. If a passenger car employs the use of emergency egress panels or additional door exits in lieu of emergency window exits or rescue access windows, then the plan must demonstrate that such alternative emergency evacuation openings provide for a level of safety at least equivalent to that required by § 238.113 or § 238.114, or both. The plan must address the location, design, and signage and instructions for the alternative emergency evacuation openings.

238.743      Emergency lighting.

(a) Except as provided in paragraph (b) of this section, Tier III trainsets shall comply with the emergency lighting requirements specified in § 238.115.

(b) In lieu of the requirements in § 238.115(b)(4)(ii), emergency lighting back-up power systems shall at a minimum be capable of operating after a collision or derailment resulting in the individually applied accelerations of 5g longitudinal, 3g lateral, and 3g vertical, provided that—

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(i) The average longitudinal deceleration of the CG of each vehicle during the dynamic collision scenario specified in § 238.705 does not exceed 5g during any 100-ms period; and

(ii) Attachment strength is based on a minimum of 5g longitudinal, 3g lateral, and 3g vertical acceleration resistance; and

(iii) Use of the standard is carried out in accordance with any conditions identified in the railroad's system safety plan, as approved by FRA.

\* \* \* \* \*

#### CAB EQUIPMENT

*[NOTE: This represents only a portion of the cab equipment provisions that will be applicable to Tier III passenger equipment. All else being equal, Tier III passenger equipment will be subject to the same provisions as required for Tier II passenger equipment.]*

#### § 238.751     Alerters.

(a) An alerter shall be provided in the operating cab of each Tier III trainset unless operating in a territory where an alternate technology providing equivalent safety, such as redundant automatic train control or redundant automatic train stop system, is installed.

(b) Upon initiation of the alerter, the engineer must acknowledge the alerter within the time period and according to the parameters specified in the railroad's system safety plan in order for train operation to remain under the full control of the engineer.

(c) If the engineer does not acknowledge the alerter as specified in paragraph (b) of this section, at a minimum a retrievable full service brake application shall occur until the train has stopped, unless the crew intervenes as described in paragraph (d) of this section.

(d) To retrieve the full service brake application described in paragraph (c) of this section, the engineer must acknowledge the alerter and activate appropriate controls to issue a command for brake application as specified in the railroad's system safety plan.

(e) If an alternate technology to the alerter is used, the railroad shall conduct a hazard analysis that confirms the ability of the technology to provide an equivalent level of safety. This analysis shall be included in the railroad's system safety plan.

238.753      Sanders.

(a) A Tier III trainset shall be equipped with operative sanders, if required by the railroad's system safety plan.

(b) Sanders required under this section shall comply with § 229.131(a), (b), and (d) of this chapter, except that instead of the requirements of § 229.9 and § 229.23 of this chapter:

(1) The requirements of § 238.17 shall apply to the tagging and movement of a Tier III trainset with defective sanders; and

(2) The requirements of the railroad's ITM plan shall apply to the next periodic inspection of such a trainset.

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(c) In addition to the requirements in paragraph (b) of this section, the railroad's ITM plan shall specify the inspection, testing, and maintenance requirements for Tier III trainsets equipped with sanders.

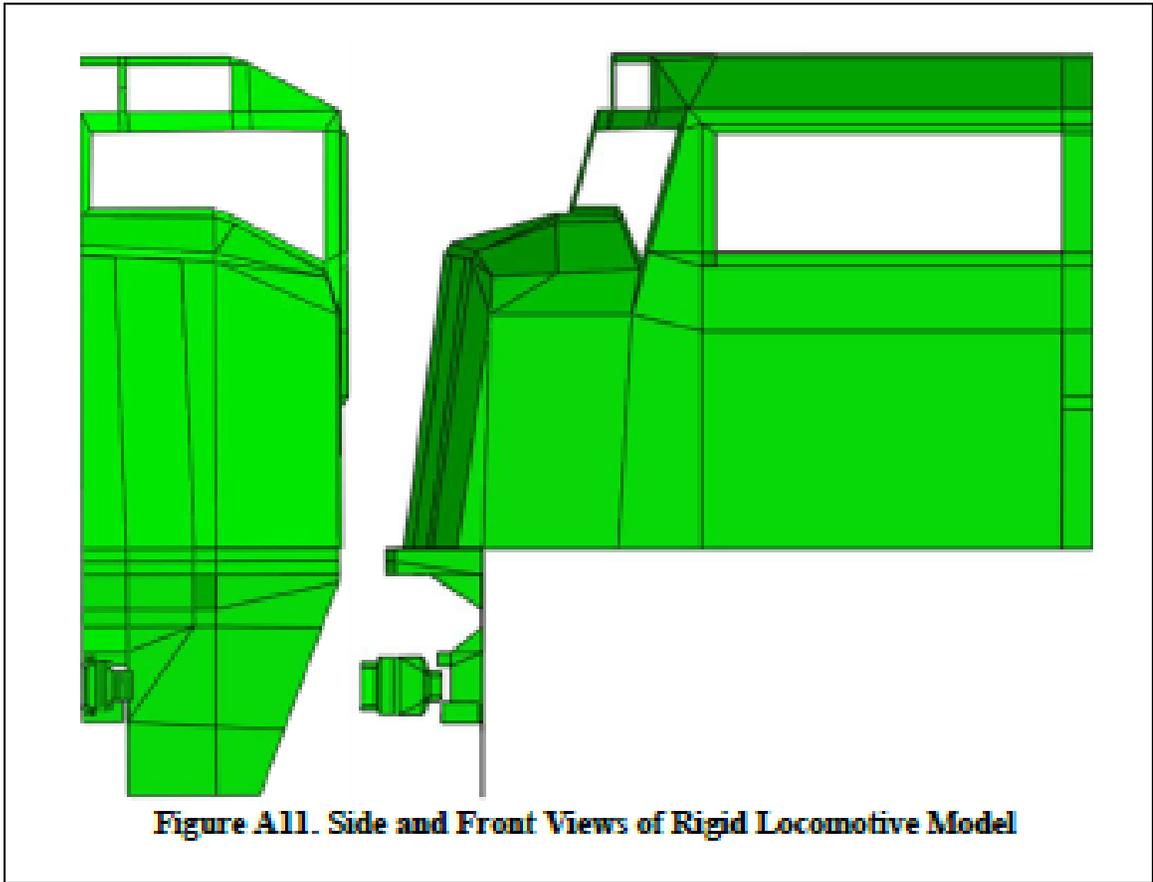
\* \* \* \* \*

*[The following table and figure were added to address the need for additional information regarding the conditions for the required dynamic collision scenarios. This information is based on the material currently provided as guidance, but will be formally added to the regulation to correspond with the crashworthiness requirements being codified. FRA will examine the level of detail necessary (e.g. nominal dimensions, coordinates, etc.) and other potential means of making this information accessible for use.]*

Table 1 to Subpart H of Part 238—*[enter title]*

<b>Vehicle</b>	<b>Crush (in)</b>	<b>Force (lbf)</b>
Conventional Passenger Car	0	0
	3	80,000
	6	2,500,000
Conventional Locomotive	0	0
	2.5	100,000
	5	2,500,000

Figure 1 to Subpart H of Part 238—*[enter title]*



[xx]. Subpart I is added to part 238 to read as follows:

Subpart I—Inspection, Testing, and Maintenance Requirements for Tier III Passenger Equipment

Sec.

238.801 Scope.

238.803 Inspection, testing, and maintenance requirements; brake system.

238.805 Periodic tests; brake system.

\* \* \* \* \*

**Subpart I—Inspection, Testing, and Maintenance Requirements for Tier III Passenger Equipment**

*[NOTE: This represents only a portion of the ITM provisions that will be applicable to Tier III passenger equipment. All else being equal, Tier III passenger equipment will be subject to the same provisions as required for Tier II passenger equipment.]*

§ 238.801     Scope.

This subpart contains specific requirements for railroad passenger equipment operating in a shared right-of-way at speeds not exceeding 125 mph and in an exclusive right-of-way without grade crossings at speeds exceeding 125 mph but not exceeding 220 mph.

§ 238.803     Inspection, testing, and maintenance requirements; brake system.

Tier III trainsets shall be subject to the inspection, testing, and maintenance requirements of subpart F of this part, with the following exceptions:

(a)     The equivalent of a Class 1 brake test contained in § 238.313 shall be developed for use where required by this part, and shall be defined in the railroad's ITM plan.

(b)     Movement of a trainset with a power brake defect as defined in § 238.15 shall be conducted in accordance with § 238.15, with the following exceptions:

(1)     The confirmation of the percentage of operative power brakes required by § 238.15(c)(4)(iv) may be by a technological method specified in the railroad's system safety plan;

(2) The computation of the percentage of operative power brakes required by § 238.15(c)(1) shall be determined by a formula specified in the railroad's system safety plan; and

(3) Operating restrictions determined by the percentage of operative power brakes in a trainset shall be based upon the requirements of § 238.15, for trainsets operating in shared rights-of-way with Tier I and Tier II equipment; operating restrictions shall be based upon a percentage of operative brakes as defined in the railroad's system safety plan, for trainsets operating in an exclusive right of way for Tier III equipment.

§ 238.805     Periodic tests; brake system.

(a) Each Tier III trainset shall be subject to the tests and inspections prescribed in the railroad's ITM plan. All testing required under this section shall be performed at the intervals specified in the ITM plan. The railroad's ITM plan shall include, but not be limited to, the following requirements:

(1) The filtering devices or dirt collectors located in the main reservoir supply line to the air brake system shall be cleaned, repaired, and replaced in accordance with the ITM plan.

(2) All brake control equipment and truck brake equipment shall be cleaned, repaired, and tested in accordance with the ITM plan.

(3) The date and place of cleaning, repairing, or testing shall be recorded on the railroad's data management system and the person performing the work and that person's supervisor shall sign the form electronically. A record of the components of the

air brake system that are cleaned, repaired, or tested shall be kept in the railroad's electronic files.

(b) Each periodic inspection shall include, but not be limited to, the following requirements:

(1) All mechanical gauges used by the engineer to aid in the control or braking of the trainset shall be tested by comparison with a dead-weight tester or a test gauge designed for this purpose. A gauge or device shall not be in error more than five percent, or three p.s.i., whichever is less.

(2) All electrical devices and visible insulation shall be inspected.

(3) All cable connections between cars and jumpers that are designed to carry 600 volts or more shall be thoroughly cleaned, inspected, and tested for continuity. A microprocessor-based self-monitoring event recorder, if installed, is exempt from periodic inspection.

\* \* \* \* \*

[xx]. Appendix B to part 238 is amended by adding text to the end of note 16 of paragraph (c) to read as follows:

**Appendix B to Part 238—Test Methods and Performance Criteria for the Flammability and Smoke Emission Characteristics of Materials Used in Passenger Cars and Locomotive Cabs**

\* \* \* \* \*

(c) \* \* \*

16 \* \* \* For purposes of this Note, , the floor assembly of a

vehicle in a Tier III trainset may be tested together with undercar design features that

separate the vehicle from the fire source, i.e., skirts and bottom covers, to protect against a fire source under and external to the vehicle. To assess the safety associated with testing the floor assembly in this manner, and to protect against a fire source under the floor assembly but internal to the vehicle, safety must also be demonstrated by conducting a fire hazard analysis that includes the considerations in Note 17.

\* \* \* \* \*

[xx]. Appendix F to part 238 is amended by revising .... to read as follows:

**Appendix F to Part 238—Alternative Dynamic Performance Requirements for Front End Structures of Cab Cars and MU Locomotives**

*[The CFR references in Appendix F will need to be revised to conform to the changes in this rulemaking, mainly to reflect the addition of Tier III standards.]*

[xx]. Appendix G to part 238 is added to read as follows:

**Appendix G to Part 238—Alternative Requirements for Evaluating the Crashworthiness and Occupant Protection Performance of a Tier I Passenger Trainset**

GENERAL

This appendix applies to Tier I alternative passenger trainsets, as described below.

While the appendix may refer to specific units of rail equipment in a trainset, the alternative requirements in this appendix apply only to a trainset as a whole.

This appendix specifies requirements in the alternative to the crashworthiness and occupant protection performance requirements for Tier I passenger equipment in §§ 238.203, Static end strength, 238.205, Anti-climbing mechanism, 238.207, Link between coupling mechanism and car body, 238.211, Collision posts, 238.213, Corner posts, and

238.219, Truck-to-car-body-attachment. To maintain their integrity, these requirements are intended to apply as a whole. They also apply together with the requirements of § 238.209, Forward end structure of locomotives, including cab cars and MU locomotives, § 238.215, Rollover strength, § 238.217, Side structure, and § 238.233, Interior fittings and surfaces, as well as APTA standards for occupant protection, as specified in this appendix.

For ease of comparison with the Tier I requirements in subpart C of this part, this appendix is arranged in order by the Tier I section referenced.

Use of this appendix to demonstrate alternative crashworthiness and occupant protection performance for Tier I passenger equipment is subject to FRA review and approval, as provided in § 238.201.

#### OCCUPIED VOLUME INTEGRITY

(a) In lieu of meeting the requirements of § 238.203, the units of a Tier I alternative passenger trainset may demonstrate their occupied volume integrity (OVI) by complying with both the quasi-static compression load and dynamic collision requirements in § 238.703(b) and § 238.705, respectively.

#### OVERRIDE PROTECTION

(b) Colliding equipment. In lieu of meeting the requirements of § 238.205, the units of a Tier I alternative passenger trainset may demonstrate their ability to resist vertical climbing and override at each colliding interface during a train-to-train collision by complying with the dynamic collision requirements in § 238.707(a).

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(c) Connected equipment. In lieu of meeting the requirements of §§ 238.205 and 238.207, the units of a Tier I alternative passenger trainset may demonstrate their ability to resist vertical climbing and override, when connected, by complying with the dynamic collision requirements in § 238.707(b).

FLUID ENTRY INHIBITION

(d) In lieu of meeting the requirements of § 238.209(a), each cab end of a Tier I alternative passenger trainset may demonstrate its ability to inhibit fluid entry by complying with the requirements in § 238.709.

END STRUCTURE INTEGRITY OF CAB END

(e) Each cab end of a Tier I alternative passenger trainset is subject to the requirements of appendix F to this part to demonstrate end structure integrity for the cab end. For those cab ends without identifiable corner or collision posts, the requirements of appendix F apply to the end structure at the specified locations, whether or not the structure at the specified locations is a post.

END STRUCTURE INTEGRITY OF NON-CAB END

(f) In lieu of meeting the applicable requirements of §§ 238.211 and 238.213, the units of a Tier I alternative trainset may demonstrate end structure integrity for other than the cab end(s) of the trainset by complying with the requirements in § 238.713(b) and (c).

#### ROOF AND SIDE STRUCTURE INTEGRITY

(g) A Tier I alternative passenger trainset is subject to the requirements of §§ 238.215 and 238.217 to demonstrate roof and side structure integrity.

#### TRUCK ATTACHMENT

(h) In lieu of meeting the requirements of § 238.219, the units of a Tier I alternative passenger trainset may demonstrate their truck-to-carbody attachment integrity by complying with the requirements in § 238.717 (b) through (e).

#### INTERIOR FIXTURE ATTACHMENT

(i) A Tier I alternative passenger trainset is subject to the interior fixture requirements in § 238.233. Interior fixtures must also comply with APTA standard SS-C&S-006-98, Rev. 1, Standard for Attachment Strength of Interior Fittings for Passenger Railroad Equipment, and those portions of APTA standard SS-C&S-034-99, Rev. 2, Standard for the Design and Construction of Passenger Railroad Rolling Stock, relating to interior fixtures.

#### SEAT CRASHWORTHINESS (PASSENGER AND CREW)

(j) Passenger seating. Passenger seating in a Tier I alternative passenger trainset is subject to the requirements for seats in § 238.233, and must also comply with APTA standard SS-C&S-016-99, Rev. 2, Standard for Passenger Seats in Passenger Rail Cars.

(k) Crew seating. Each seat provided for an employee regularly assigned to occupy the cab of a Tier I alternative passenger trainset, and any floor-mounted seat in the cab, must comply with the following:

(1) Section 238.233(e), (f), and (g), including the loading requirements of 8g longitudinal, 4g lateral, and 4g vertical; and

(2) The performance, design, and test criteria of AAR-RP-5104, Locomotive Cab Seats, April 2008.