

the railroad which addresses the location and quantity of the materials used, as well as vulnerability of the materials to ignition, flame spread, and smoke generation. These portions include equipment carrying portions of a vehicle's roof and the interior structure separating the levels of a bi-level car, but do not include a flooring assembly subject to Note 16. A railroad is not required to use the ASTM E 119-00a test method.

[67 FR 42910, June 25, 2002, as amended at 74 FR 25175, May 27, 2009]

#### APPENDIX C TO PART 238—SUSPENSION SYSTEM SAFETY PERFORMANCE STANDARDS

This appendix contains the minimum suspension system safety performance standards for Tier II passenger equipment as required by §238.427. These requirements shall be the basis for evaluating suspension system safety performance until an industry standard acceptable to FRA is developed and approved under the procedures provided in §238.21.

(a) Passenger equipment suspension systems shall be designed to limit the lateral and vertical forces and lateral to vertical (L/V) ratios, for the time duration required to travel five feet at any operating speed or over any class of track, under all operating conditions as determined by the railroad, as follows:

(1) The maximum single wheel lateral to vertical force (L/V) ratio shall not exceed Nadal's limit as follows:

$$\text{Wheel L/V} \leq \frac{\tan(\delta) - \mu}{1 + \mu \tan(\delta)}$$

where:

$\delta$ =flange angle (deg).

$\mu$ =coefficient of friction of 0.5.

(2) The net axle lateral force shall not exceed 0.5 times the static vertical axle load.

(3) The vertical wheel/rail force shall not be less than or equal to 10 percent of the static vertical wheel load.

(4) The sum of the vertical wheel loads on one side of any truck shall not be less than or equal to 20 percent of the static vertical axle load. This shall include the effect of a crosswind allowance as specified by the railroad for the intended service.

(5) The maximum truck side L/V ratio shall not exceed 0.6.

(6) When stopped on track with a uniform 6-inch superelevation, vertical wheel loads, at all wheels, shall not be less than or equal to 60 percent of the nominal vertical wheel load on level track.

(b) For purposes of this appendix, wheel/rail force measurements shall be processed through a low pass filter having a cut-off frequency of 25 Hz.

#### APPENDIX D TO PART 238—REQUIREMENTS FOR EXTERNAL FUEL TANKS ON TIER I LOCOMOTIVES

The requirements contained in this appendix are intended to address the structural and puncture resistance properties of the locomotive fuel tank to reduce the risk of fuel spillage to acceptable levels under derailment and minor collision conditions.

(a) *Structural strength*—(1) *Load case 1—minor derailment.* The end plate of the fuel tank shall support a sudden loading of one-half the weight of the car body at a vertical acceleration of 2g, without exceeding the ultimate strength of the material. The load is assumed to be supported on one rail, within an eight inch band (plus or minus) at a point nominally above the head of the rail, on tangent track. Consideration should be given in the design of the fuel tank to maximize the vertical clearance between the top of the rail and the bottom of the fuel tank.

(2) *Load case 2—jackknifed locomotive.* The fuel tank shall support transversely at the center a sudden loading equivalent to one half the weight of the locomotive at a vertical acceleration of 2g, without exceeding the ultimate strength of the material. The load is assumed to be supported on one rail, distributed between the longitudinal center line and the edge of the tank bottom, with a rail head surface of two inches.

(3) *Load case 3—side impact.* In a side impact collision by an 80,000 pound Gross Vehicle Weight tractor/trailer at the longitudinal center of the fuel tank, the fuel tank shall withstand, without exceeding the ultimate strength, a 200,000 pound load (2.5g) distributed over an area of six inches by forty-eight inches (half the bumper area) at a height of thirty inches above the rail (standard DOT bumper height).

(4) *Load case 4—penetration resistance.* The minimum thickness of the sides, bottom sheet and end plates of the fuel tank shall be equivalent to a 5/16-inch steel plate with a 25,000 pounds-per-square-inch yield strength (where the thickness varies inversely with the square root of yield strength). The lower one third of the end plates shall have the equivalent penetration resistance by the above method of a 3/4-inch steel plate with a 25,000 pounds-per-square-inch yield strength. This may be accomplished by any combination of materials or other mechanical protection.

(b) *Sideswipe.* To minimize fuel tank damage during sideswipes (railroad vehicles and grade crossings), all drain plugs, clean-out ports, inspection covers, sight glasses, gauge openings, etc., must be flush with the tank surface or adequately protected to avoid catching foreign objects or breakage. All seams must be protected or flush to avoid catching foreign objects.