

Federal Railroad Administration

RSAC Engineering Task Force: Criteria and Procedures for Evaluating the Crashworthiness of Alternately-Designed Passenger Rail Equipment for Tier I Service

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- Mission
- Technical Criteria and Procedures
- Development Process
- Summary

- Produce a set of technical evaluation criteria and procedures for passenger rail equipment built to alternative designs
- Provide a means of establishing whether an alternative design would result in performance at least equal to the structural design standards set forth in the Tier I standards
- Form a technical basis for making determinations concerning equivalent safety
- Provide a technical framework for presenting evidence to FRA in support of any request for waiver of the compressive (buff) strength requirement

- Meeting 1 – Cambridge, November 2009
 - Review of Technical Information
- Meeting 2 – Philadelphia, December 2009
 - Discussion of Strawman
- Meeting 3 – Atlanta, January 2010
 - Consensus on Criteria Scope
- Meeting 4 – Orlando, March 2010
 - Consensus on Criteria Values
- Report Development
 - Report Components, Initial and Second Draft Reviewed via E-mail and Conference Calls
 - Final Draft Accepted by ETF on August 27th
 - APTA Comment Incorporated into Final Draft

- 238.203 Static end strength.
- 238.205 Anti-climbing mechanism.
- 238.207 Link between coupling mechanism and car body.
- 238.209 Forward-facing end structure of locomotives.
- 238.211 Collision posts.
- 238.213 Corner posts.
- 238.215 Rollover strength.
- 238.217 Side structure.
- 238.219 Truck-to-car-body attachment.
- 238.233 Interior fittings and surfaces.
- APTA SS-C&S-016-99 Rev 1, (updated 3/2004) Standard for Row-to-Row Seating in Commuter Rail Cars

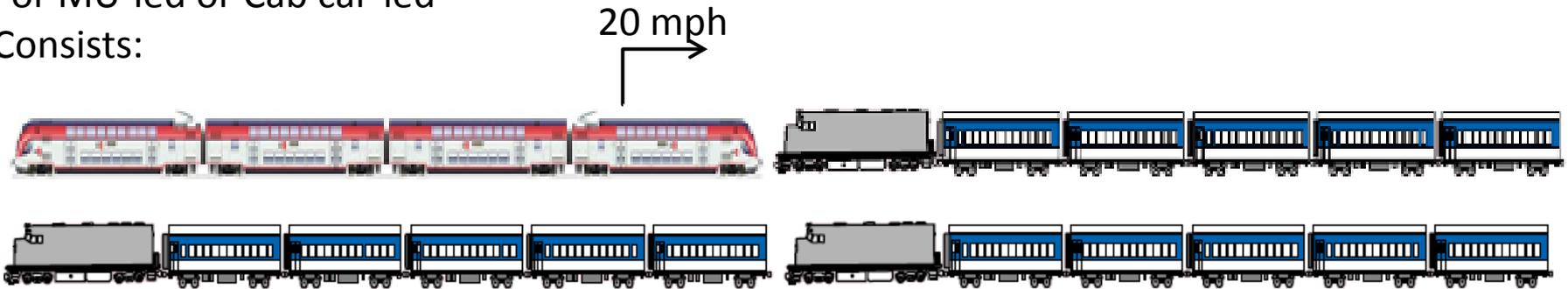
- Collision Scenarios
 - Train-to-train Collision Performance
 - Ideal Case
 - Colliding Car Override
 - Coupled Car Override
 - Truck Attachment
 - Grade-crossing Performance (Appendix F)
 - 'Collision Post' Impact
 - Corner Impact
- Occupant Volume
 - End Strength (Occupied Volume Integrity)
 - End Structure Integrity
 - Side Strength
 - Roof Strength
 - Prevention of Commodity Entry
- Occupant Protection
 - Occupant Environment
 - Interior Fixture Attachment
 - Occupant Protection Features

Collision Scenario

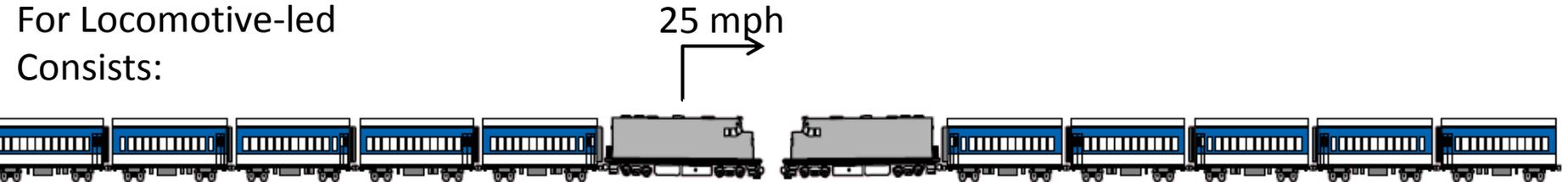
*Moving Train: Train Reflects
Configuration and Vehicle Weights
Proposed for Operation*

*Standing Train: Locomotive and 5 Coach Cars
Conventional Locomotive = 260,000 lb
Conventional Coach Cars = 95,000 lb*

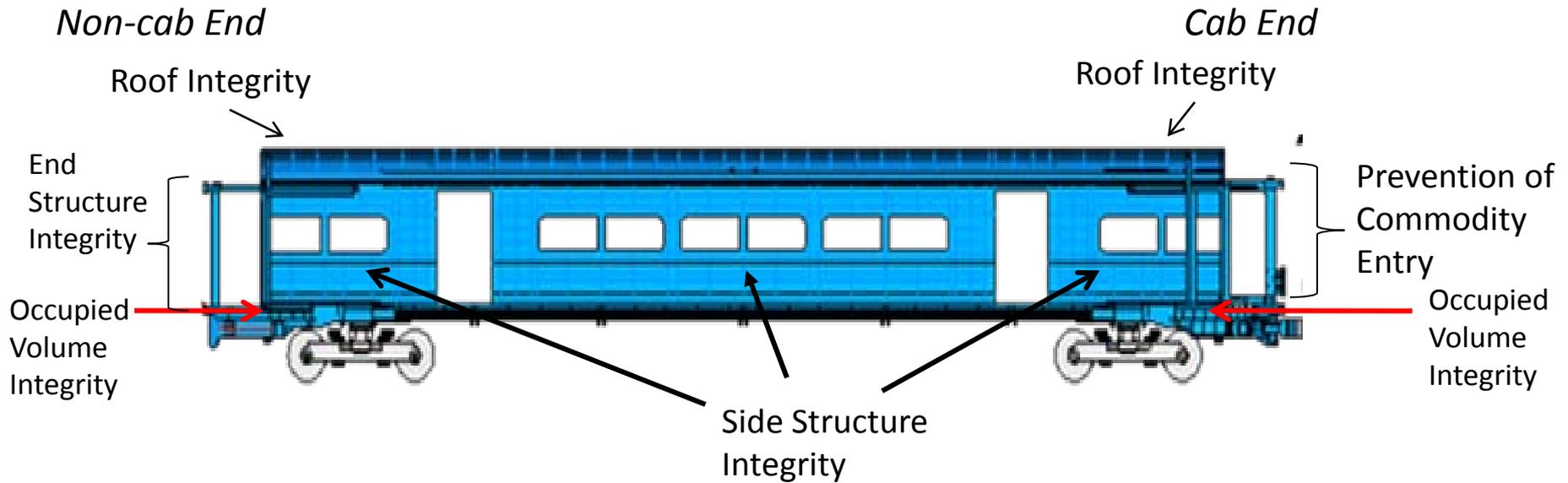
For MU-led or Cab car-led
Consists:



For Locomotive-led
Consists:



Occupant Volume Requirements



Schematic illustration to highlight crashworthiness features. See Criteria and Procedures report for details.

- Maintaining occupied volume is the primary goal of structural crashworthiness
- Technique other than 800 kips on the line of draft can be used for assuring occupied volume integrity
- Three Criteria Options developed to allow flexibility in vehicle design
 - Option A: 800,000 pounds applied along collision load path without permanent deformation
 - Option B: 1,000,000 pounds applied along collision load path with a limited amount of permanent deformation
 - Option C: 1,200,000 pounds applied along collision load path without crippling the occupied volume
 - All Options allow properly-validated analysis as demonstration of a vehicle meeting the Option
- The collision scenario provides further assurance on the crashworthiness

- Occupant Environment
 - Scenario Criteria Requires Safe Occupant Environment
 - Compare the secondary impact velocity (SIV) curve, to the SIV curve associated with the 8g crash pulse.
- Interior fixture attachment
 - No Criteria Option Specified
- Occupant Protection Features
 - APTA SS-C&S-016-99, Rev 2. Standard for Row-to-Row Seating in Commuter Rail Cars
 - APTA SS-C&S-011-99 Standard for Cab Crew Seating Design and Performance

- Provides an Engineering-based Methodology for Comparing the Crashworthiness of Alternative-design and Tier I Compliant Equipment
- Includes Clear Criteria for Assessing Analysis and Test Results
- Contains Examples of Practicable Analysis and Test Procedures that may be used to Demonstrate Conformity to Criteria
- Is Design Independent
 - i.e., Minimizes References to Buff Stops, Collision Posts, and Other Design-Specific Features
 - Allows for a Wide Range of Structural and Interior Design Approaches

- Engineering Task Force has Developed Criteria and Procedures for Evaluating the Crashworthiness of Alternatively-designed Passenger Equipment for Tier I Service
 - Framework for Presenting Technical Information in Support of a Waiver Request
 - Design-neutral
 - Facilitates the Application of the Latest in Rail Equipment Crashworthiness Technology to the U.S.
- Status
 - ETF Voted to Accept the Criteria and Procedures Report
 - PSWG Votes Today
 - If PSWG Accepts, then RSAC Votes Next Week
 - If PSWG Rejects, Report is Returned to ETF