

2017

FRA Rail Program Delivery

Meeting

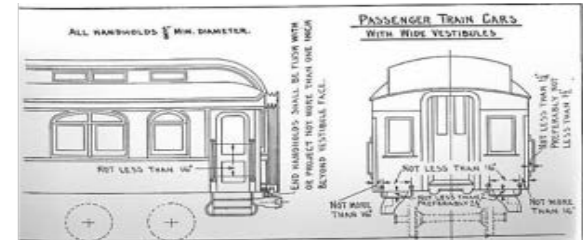
FRA & The Next Generation of High Speed Rail Equipment

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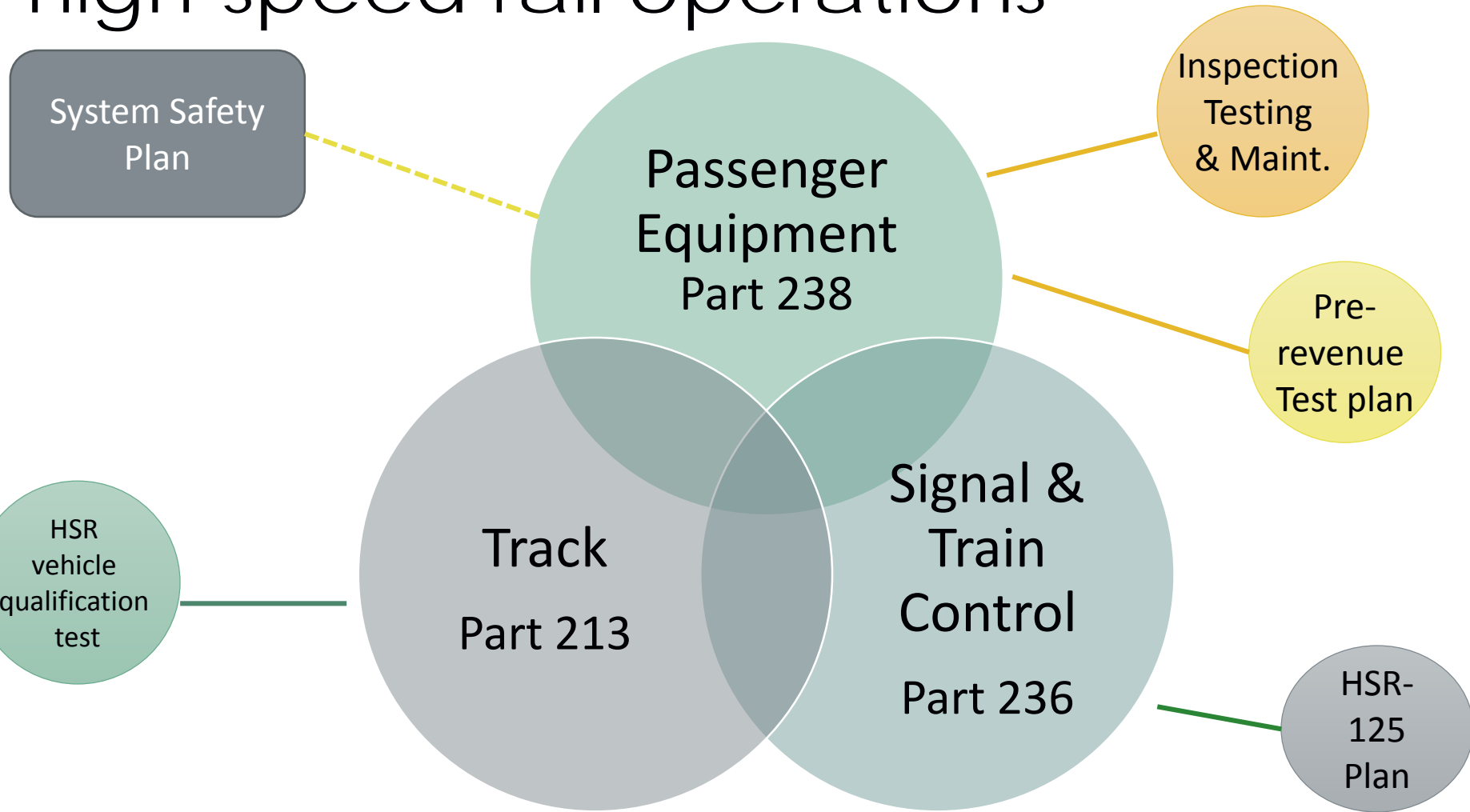
Today's Presentation

- ▶ Existing regulations governing High-speed Operations
- ▶ Railroad Safety Advisory Committee (RSAC) Engineer Task Force (ETF) – Objectives & Vision for HSR
- ▶ Development of standards to accommodate new & innovative technologies



Existing Regulations Governing high-speed rail operations

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Existing Passenger Regulatory Environment

Transit Vehicles ("Shared Use")



Max. Speed: 79 mph

Interoperable with freight: no

Carbody:

- Built to customer specifications
- **Not compliant w/ 49 CFR §229 & 238**

Interior attachments: no requirement

Passenger Occupied Lead Car: yes

Glazing: typically complies with 49 CFR § 223

Brake System: varies (may incl. track brakes)

Inspection/Maintenance: varies

NOTES:

- **Requires waiver from FRA Safety Board**

Tier I - Conventional



Max. Speed: 125 mph

Interoperable with freight: yes

Carbody:

- Strength based protection
- 800,000-lbs buff-load frame
- Structure fully compliant w/ 49 CFR §229 & 238

Interior attachments: 8g/4g/4g

Passenger Occupied Lead Car: yes

Glazing: complies with 49 CFR § 223

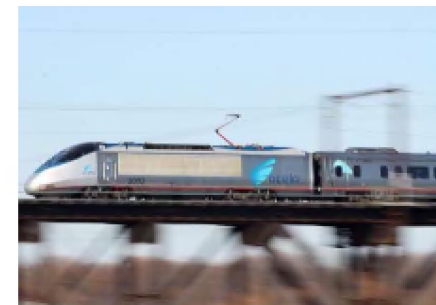
Brake System: traditional pneumatic
- complies with 49 CFR § 229

Inspection/Maintenance: periodic

NOTES:

- Traditional "FRA compliant" locomotives and passenger cars

Tier II



Max. Speed: 150 mph (current) / 160 (proposed)

Interoperable with freight: yes

Carbody:

- **Uses some Crash Energy Management (CEM)**
- **2,100,000-lbs buff-load power car**
- **800,000-lbs buff-load trailers**

Interior attachments: 8g/4g/4g

Passenger Occupied Lead Car: no

Glazing: complies with 49 CFR § 238, Subpart E

Brake System: traditional pneumatic
- complies with 49 CFR § 238.431

Inspection/Maintenance:

Continuous Maintenance (Based on ITM plan)

NOTES:

- Acela is the only Tier II equipment in operation

ETF Vision & Objectives

Vision:

Create passenger equipment regulatory environment incorporating “service proven” designs, advanced technology, and a systematic approach to safety.

Tier I – conventional & alternative crashworthiness, speeds up to 125mph

Tier II – 160 mph maximum authorized speed on existing ROW (i.e. NEC)

Tier III – interoperable w/ all tiers up to 125 mph, dedicated ROW up to 220 mph

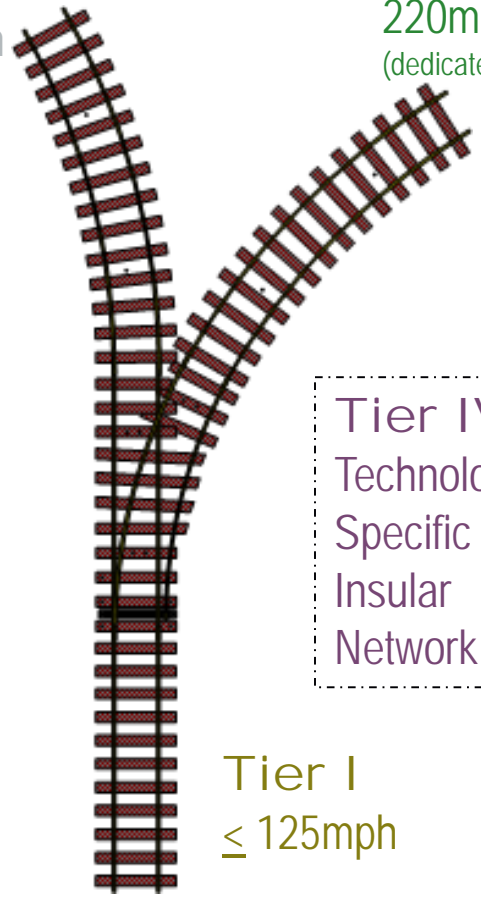
Tier IV – Technology specific HSR projects and “other” technologies for insular systems.

Tier II
Up to 160mph
(e.g. NEC)

Tier III
220mph
(dedicated ROW)

Tier IV
Technology
Specific &
Insular
Network

Tier I
≤ 125mph



Proposed Additions to Passenger Regulatory Environment

Tier I – Alternative Crashworthiness



Tier III



Other (Tier IV)



Max. Speed: 125 mph

Interoperable with freight: yes

Carbody:

- Performance based protection
- Uses Crash Energy Management (CEM)
- Alternative to 49 CFR §229/238 compliance
- Follows Engineering Task Force (ETF) criteria

Interior attachments: 8g/4g/4g

Passenger Occupied Lead Car: yes

Glazing: complies with 49 CFR § 223

Brake System: traditional pneumatic
- complies with 49 CFR § 229

Inspection/Maintenance: periodic

NOTES:

- Currently allowed by Safety Board waiver
- Allows use contemporary design techniques

Max. Speed: 220 mph (dedicated ROW)
125 mph (shared track)

Interoperable with freight: ≤ 125 mph

Carbody:

- Performance based protection
- Uses Crash Energy Management (CEM) features
- Follows Engineering Task Force (ETF) criteria

Interior attachments: 8g/4g/4g
or 5g/3g/3g (if justified)

Passenger Occupied Lead Car: yes

Glazing: follows ETF recommendations

Brake System: technology neutral
- based on ETF recommendations

Inspection/Maintenance:

Continuous Maintenance (Based on ITM plan)

NOTES:

- Utilizes system safety approach
- Allows use of “service proven” designs worldwide

Max. Speed: 0-220+ mph

(for dedicated Right-of-Way ONLY)

Interoperable with freight: no

Carbody:

- Built to customer specifications
- Not compliant w/ 49 CFR §229 & 238

Interior attachments:

- per customer specification

Passenger Occupied Lead Car: yes

Glazing: likely to follow ETF requirements

Brake System: per customer specification

Inspection/Maintenance:

Continuous Maintenance

NOTES:

- Requires FRA special approval, typically under a Rule of Particular (RPA)

The growing role of alternative compliance"

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- ▶ FRA's is developing proposed rules to provide alternatives for meeting crashworthiness requirements
- ▶ The adoption of these performance based regulations will allow for:
 - Better incorporation of **contemporary** design techniques and standards
 - A means to provide compatibility for high-speed equipment to operate intermixed with conventional
- ▶ The standards were developed with industry input through FRA's Railroad Safety Advisory Committee's (RSAC) Engineering Task Force (ETF)



What is “Tier III?”

Tier III defines the requirements for next generation very high-speed trainsets

Key features are:

- ▶ Allows maximum authorized speeds of up to 220 mph
- ▶ Provides complete interoperability with conventional passenger & freight operations up to 125 mph
- ▶ Designed to harmonizes with “service proven” international standards and design methodologies
- ▶ Follows on the inspection and maintenance regime established for service proven trainsets.



Tier III regulatory approach

Guiding principle: conceive performance-based regulations which accommodate existing service-proven designs **WITH MINIMUM MODIFICATIONS.**

▶ **Approach:**

- ▶ **Systematic** – consider safety from a “system” perspective
- ▶ **Technology Neutral** – some metrics must be defined by the system and technology implemented, not prescribed



Rotary eddy current brake (courtesy of Wikipedia)

Regulations that make up Tier III requirements

- ▶ Trainset Structure/Crashworthiness
 - ▶ Interior Attachments
 - ▶ Glazing
 - ▶ Brake System
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- ▶ Emergency Systems/Lighting
 - ▶ Safety appliances
 - ▶ General Safety (part 229)
 - ▶ Cab Conditions – noise, general conditions, sanitation
 - ▶ Cab Equipment – alerters, event recorders, cab lights
 - ▶ Exterior Appurtenances – headlights, aux lights, marker lights
 - ▶ Electrical systems – current collectors, circuit protection, insulations, treatment of high voltage, conductors, motors/generators, energy storage, power dissipation, EMI/EMC, etc.
 - ▶ Trainset Electronics
 - ▶ Compliance testing and start-up procedures
 - ▶ Inspection Testing Maintenance

NPRM 1

NPRM 2

Tier IV Concept

- ▶ Tier IV would:
 - ▶ Establish a formal means to address FRA regulated insular services
 - ▶ Would cover ANY type of technology at any speed range
 - ▶ Would require insular and protected ROW with NO grade crossings



Rules of Particular Applicability

- ▶ A Rule of Particular Applicability (RPA) is a regulation that applies to a specific railroad or a specific type of operation.
- ▶ FRA is currently considering a request from Texas Central Railway (TCR) to issue an RPA for its proposed HSR operation.
- ▶ Any resulting RPA will:
 - ▶ Be technology specific; and
 - ▶ Address all aspects of TCR's operation (HSR infrastructure, equipment and personnel).

In short...

- ▶ FRA's HSR strategy is designed to encourage the development of both:
 - ▶ A robust intercity passenger rail network; and
 - ▶ Standalone systems utilizing new & innovative technology & equipment.



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Thank you!