Federal
Railroad
Administration

RSAC Engineering Task Force: Evolution and Task II

David Tyrell – US DOT Volpe Center

Evolution of ETF

- Engineering Task Force Established by Passenger Safety Working Group, August 12, 2009
  - Tasked with Developing Technical Criteria and Procedures for Assuring the Structural Crashworthiness and Occupant Protection Performance of Alternatively-designed Equipment to be used in Tier I Service

- ETF Retasked by PSWG, July 28, 2010
  - May Address Any Type of Equipment
    - e.g., conventional locomotives, high-speed power cars, cab cars, multiple-unit (MU) locomotives, and coach cars
  - May Address Any Safety Features of the Equipment
    - e.g., crashworthiness, interior occupant protection, glazing, emergency egress, and fire safety features

ETF Initial Tasks

- Task I: Tier I Crashworthiness Criteria and Procedures
  - Waiver option to existing rules which facilitate use of alternative equipment designs in Tier I service
- Task II: Tier V (CHSTP and FLHSR) Crashworthiness Recommendations
  - No existing rules for equipment operated above 150 mph
- Additional Tasks Can Be Assigned

ETF Task II
Objective and Purpose

- Objective
  - Develop Recommended Engineering Requirements for Assuring the Structural Crashworthiness, Occupant Protection, and Glazing Performance of Equipment to be used in Tier V Service

- Purpose
  - Identify to the Rail Industry the Crashworthiness and Glazing Requirements for Passenger Equipment Intended for Operation Above 125 mph on Dedicated Track with Sophisticated Accident-Avoidance Measures

FRA Policy Documents

- Tier I Regulations
  - Based on long-standing industry practice
- Tier II Regulations
  - Require non-passenger carrying end cars
  - Require very strong operating cab
  - Require CEM features
- High-Speed Passenger Rail Safety Strategy
  - Identifies concerns with passenger-occupied end cars in Tier V service; currently not permitted
- Criteria and Procedures for Evaluating Alternative Equipment
  - Design-independent engineering requirements intended to provide equivalent crashworthiness to Tier I regulations

Accident Avoidance and Accident Mitigation

- Effective train control system capable of reducing number (frequency) and severity (speed) of certain train incidents
  - Train-to-train collisions (two trains on same track)
  - Excess speed incidents
  - Passed signals
- Even with sophisticated control system and diligent train handling, incidents may occur that present an injury hazard to passengers and crew
  - Train-to-train: NEC, Canton, MA 2008; WMATA, Washington, DC 2009
  - Fouled ROW: Transrapid, Lathen Germany 2006; RTD Littleton, Colorado 2007
  - Derailment: Tobarra, Spain 2003; Brühl, Germany 2000
- Crashworthiness and occupant protection features can help mitigate injuries and fatalities

- ***ETF Task II Accident Safety Goal***
  - ***Define scenarios of concern for operations above 125 mph on dedicated track with sophisticated accident-avoidance measures***

Structural Crashworthiness

- Non-Passenger Occupied End Cars
  - Required by Tier II and FRA HS Safety Strategy
- High OVI Strength Cab/End Cars
  - 2,100 kips Cab strength required in Tier II
  - Acela and TGV-2N transition cars built to higher strength than intermediate cars
- Cab and Trailer End Structure Strength
  - Differences between Tier I and II requirements
- Carbody Side Loads
  - Differences between Tier I and II requirements

- ***ETF Task II Structural Crashworthiness Goal***
  - ***Describe engineering requirements for end car crashworthiness for scenarios of concern***

Occupant Protection

- Occupant Injury Criteria Limits
  - Required by industry standards
- Interior Fixtures
  - Differences between Tier I and II requirements
  - e.g., Enclosed Luggage Racks Required for Tier II

- ***ETF Task II Occupant Protection Goal***
  - ***Describe occupant protection requirements for scenarios of concern***

Glazing

- End-facing exterior glazing must resist the impact of a 12-pound solid steel sphere at the maximum speed at which the vehicle will operate at an angle of 90 degrees
  - Required in Tier II
  - Increasing Speed from 150 mph to 220 mph more than Doubles the Energy of the Impact

- ***ETF Task II Glazing Goals***
  - ***Balance competing requirements (service, impact resistance, securement, emergency egress/ingress, and occupant containment …)***
  - ***Develop reliable and inexpensive test and analysis techniques to assure competing requirements are met***

ETF Task II
Planned Targets and Schedule

- Meeting #1—October 20 and 21, 2010 in Cambridge
  - Review Equipment Needs, CHSTP and FHSR
  - Discussion of Equipment-related Safety Concerns
  - Review of Crashworthiness Features of HSR Equipment, Alstom, Bombardier, Kawasaki, Rotem, Siemens, etc.

- Meeting #2—December, 2010 in Orlando (date and location to be finalized)
  - Review of Crashworthiness Requirements for HSR Equipment, SNCF, DB, RSSB, Taiwan, China, Korea, JR, etc.
  - Consensus on Scope of Engineering Individual Requirements

- Meeting #3—February, 2011 in San Francisco (date and location to be finalized)
  - Consensus on Numerical Values

- Meeting #4— April, 2011 in DC (date and location to be finalized)
  - Consensus on Text
  - Discussion of Next Steps