How High Speed Trains Work

Steve Clark

12th ANNUAL SOUTHWESTERN RAIL CONFERENCE
January 21-22, 2016 – Dallas, Texas
Some Cool Stuff about High Speed Trains

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Cool Stuff

• HSR History in USA
• Aerodynamics
• Acceleration, Braking, and Curves
• For Those That Like Railways
History of HSR in the USA
1960’s Ideas
1960’s and the USA!
DOT Test Center – Pueblo, Colorado
DOT Test Center – Pueblo, Colorado

- Transportation Technology Center
  - owned by the DOT
  - Maintained and Operated by Transportation Technology Center, Incorporated
Rohr Aerotrain TACV
Rohr Aerotrain
Rohr Aerotrain TACV
Garrett LIMRV
1970’s

1975 – HSGT Act Ends
Millions spent (billions in today’s dollars)
No real success with HSR
- Noise
- Static Electricity
- Heat
- Dust Storms
- Mice
But…a unique, world-renowned...
Crazy?...
Crazy?...
Acela Express

Boston and Washington
- 456 mi
- Up to 150 mph
- 70 mph average
- 9,000 pass per day
- 3+ million pass per year
Aerodynamics
Aerodynamic Phenomena

- Slipstreams
- Trains Meeting and Passing (open air)
- Pressure Waves Inside Tunnels
- Micro-Pressure Waves Emitted from Tunnels
- Wayside Structures
- Crosswinds
- Drag Effects
- Ballast Flight
Pressure Waves Inside Tunnels

- Generation of pressure wave
- Propagation of pressure wave
- Radiation of micro pressure wave

TRA
Texas Rail Advocates
Pressure Waves Inside Tunnels
Micro-Pressure Waves from Tunnels

- Generation of pressure wave
- Propagation of pressure wave
- Radiation of micro pressure wave
Micro-Pressure Waves from Tunnels

Tunnel Entrance Hoods

Tunnel Portal Shape
Micro-Pressure Waves from Tunnels

Train Nose Design
Micro-Pressure Waves from Tunnels

Side Branches

Air Shafts
Accelerating, Braking, and Curves
Acceleration and Braking

Typical Speed Profile

Distance

Speed
Horizontal Curves
• FHWA/TX-13/0-6698-1 “Examining Use of Public Rights of Way for High Speed Rail and Freight Transportation”, August 2013
Investon -Dallas Corridor: Wheel Rail Technology

Dallas Area

MP 244

Wheel Rail Technology on the IH 45 NB corridor

- Wheel Rail: 225 mph
- Wheel Rail: 200 mph
- Wheel Rail: 150 mph
Acceleration, Braking, and Curves

Typical Speed Profile

Figure 57. Operating Speeds of the Wheel Rail Technology on the IH 45 NB corridor
Eye Candy For Those That Like Rail
Thank You!

Steve Clark
steve.clark@arup.com