

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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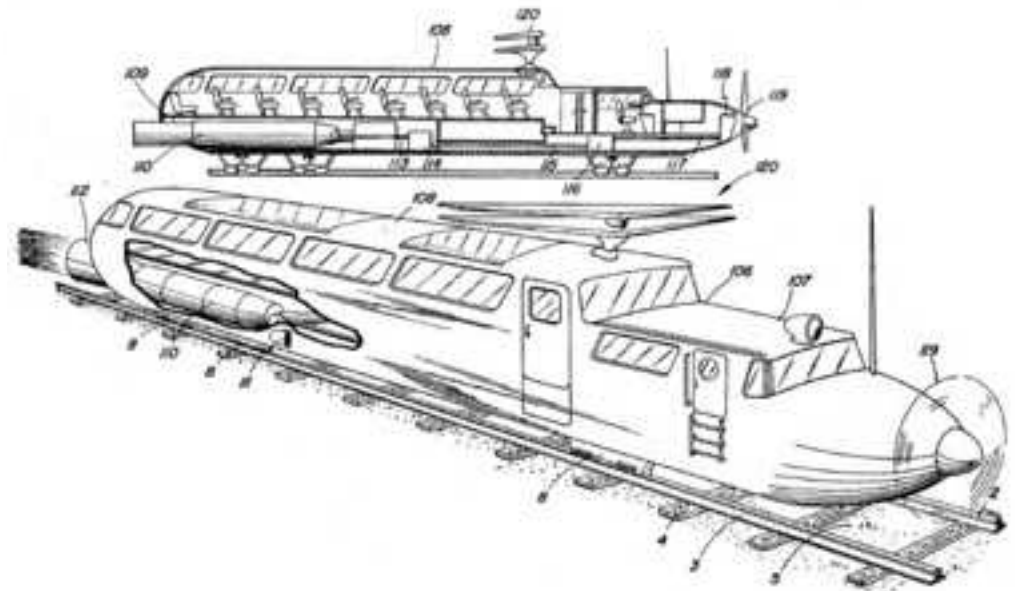
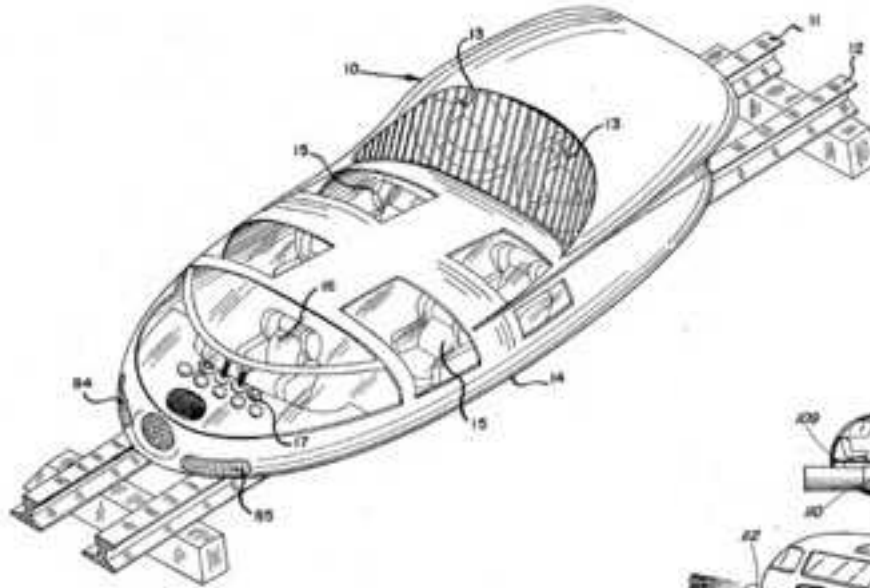


Cool Stuff

- 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)

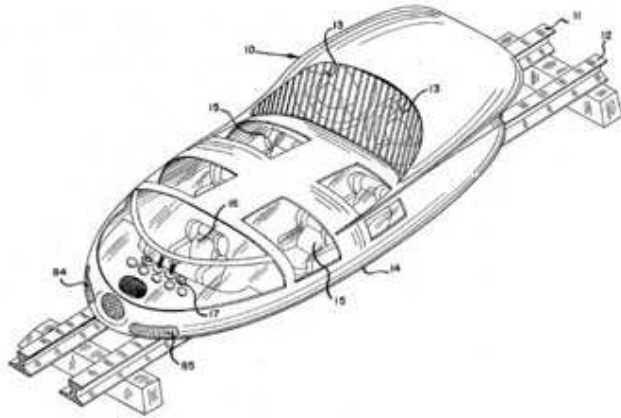
No real success with HSR

- Noise
- Static Electricity
- Heat
- Dust Storms
- Mice

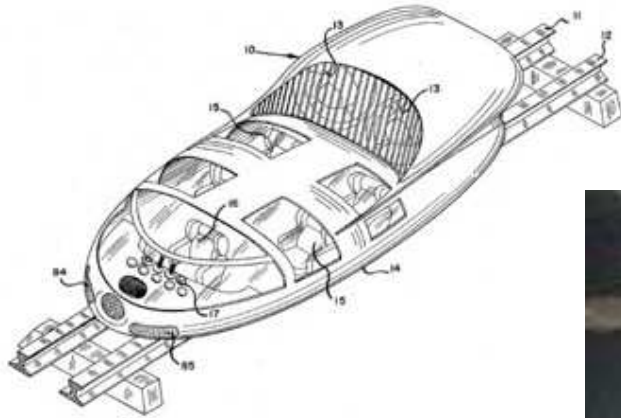
But...*a unique, world-renowned*



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

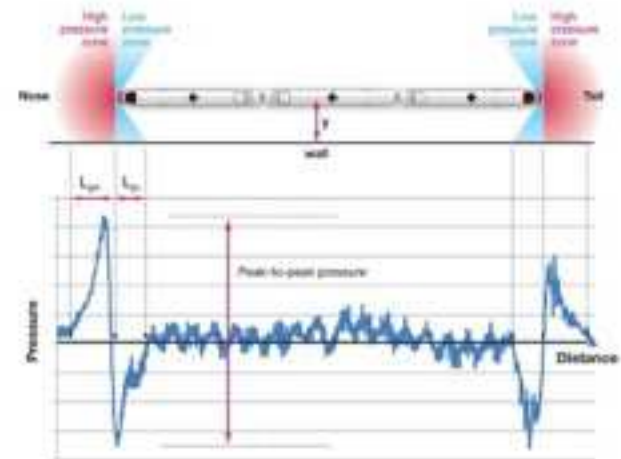




U.S. Department of
Transportation
Federal Railroad
Administration

High-Speed Rail Aerodynamic Assessment and Mitigation Report

Office of Research,
Development,
and Technology
Washington, DC 20590



DOT/FA/ORD-15/HQ

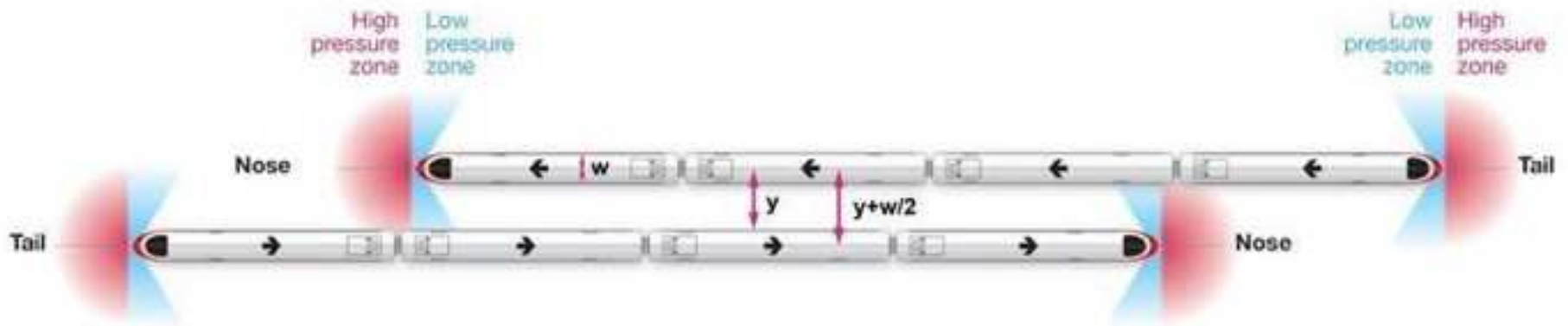
Final Report
December 2015

Aerodynamics

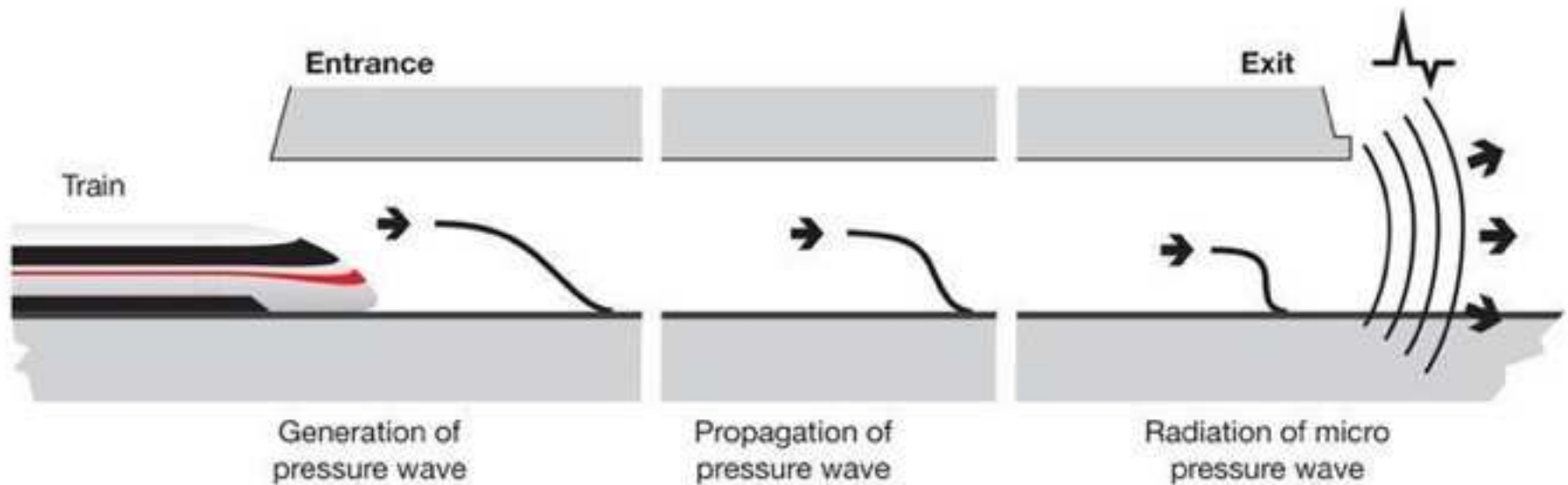
Aerodynamic Phenomena

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

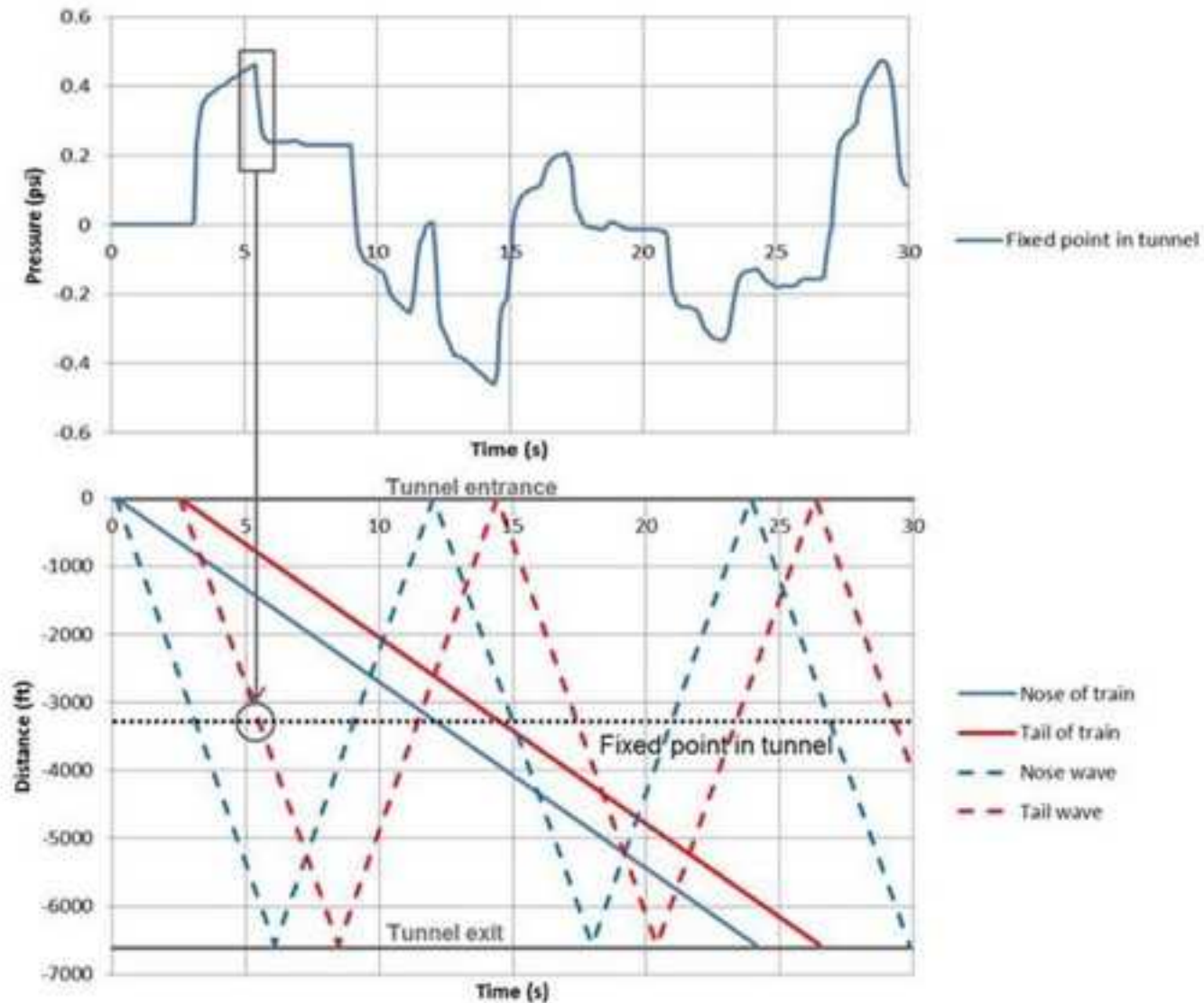
Trains Meeting and Passing



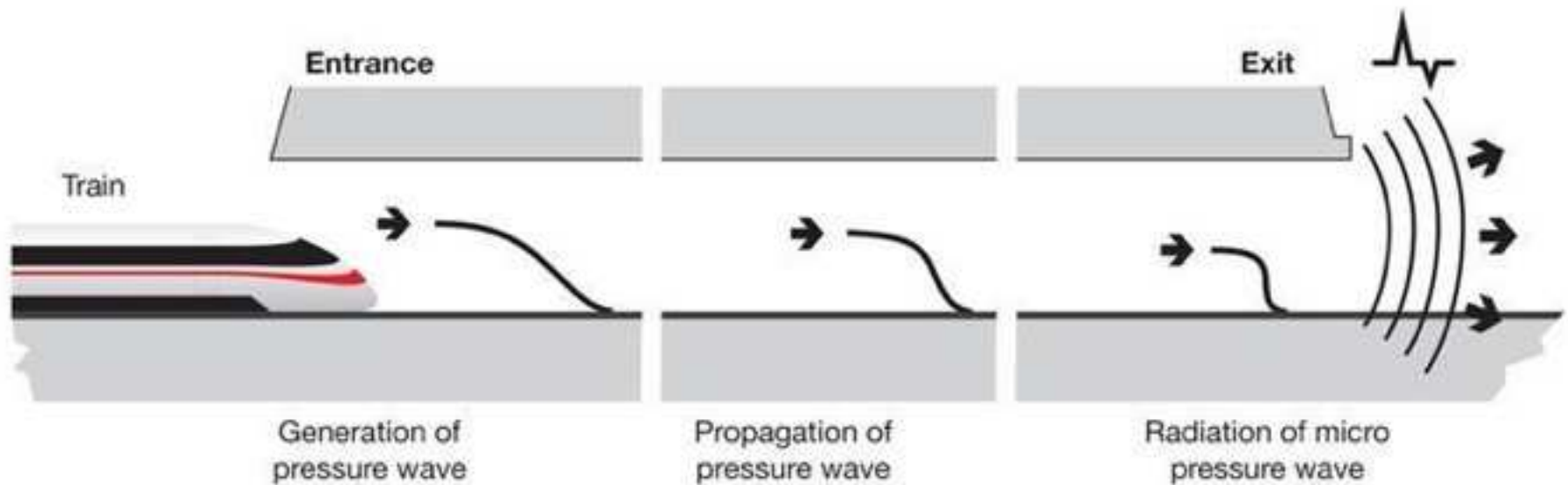
Pressure Waves Inside Tunnels



Pressure Waves Inside Tunnels



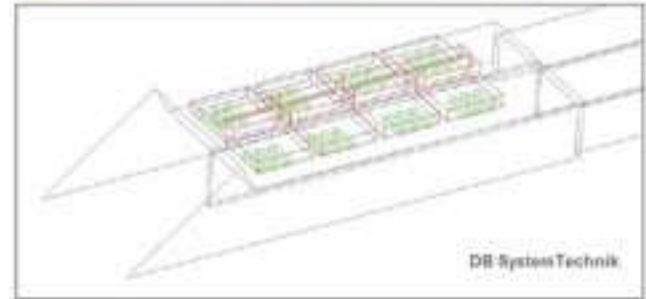
Micro-Pressure Waves from Tunnels



Micro-Pressure Waves from Tunnels



Tunnel Entrance Hoods



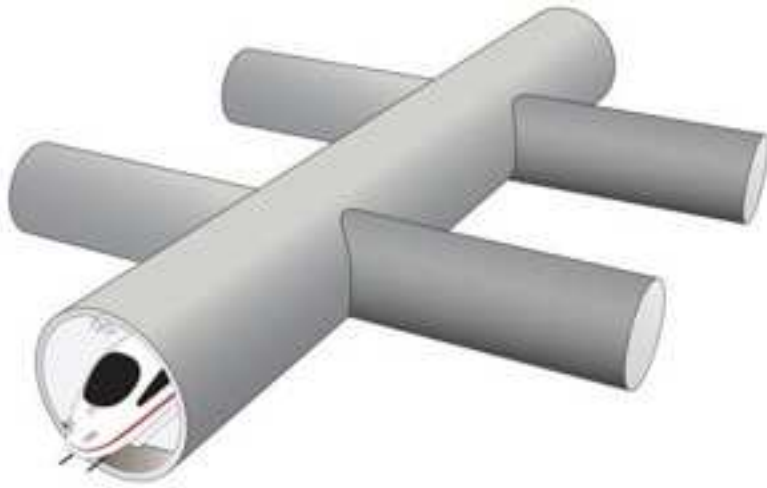
Tunnel Portal Shape

Micro-Pressure Waves from Tunnels



Train Nose Design

Micro-Pressure Waves from Tunnels



Side Branches

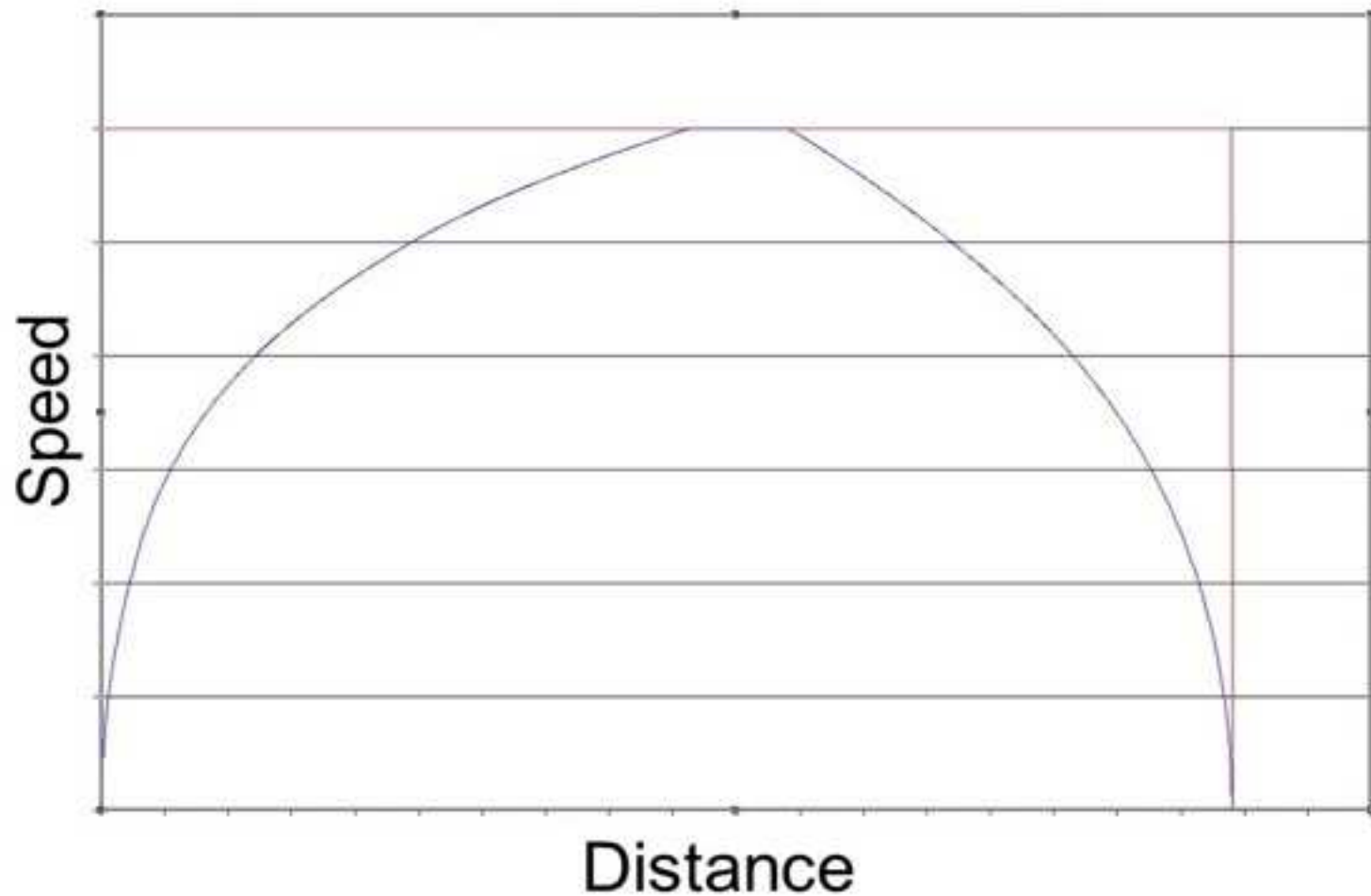


Air Shafts

Accelerating, Braking, and Curves

Acceleration and Braking

Typical Speed Profile



Horizontal Curves



Alma



- Radius = 4600 ft
Design Speed = 90 mph
- Radius = 6170 ft
Design Speed = 125 mph
- Radius = 17100 ft
Design Speed = 205 mph



Rice

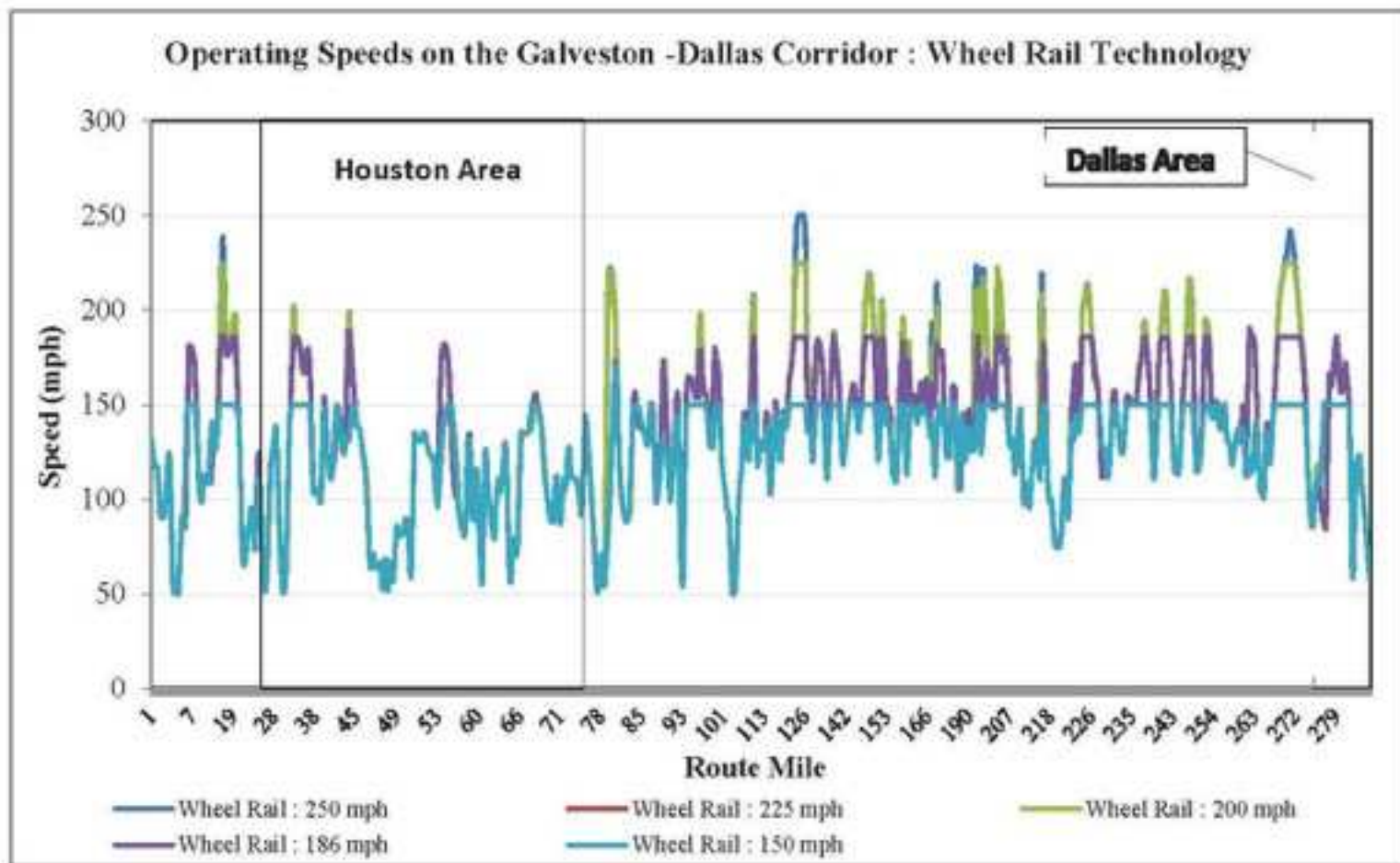
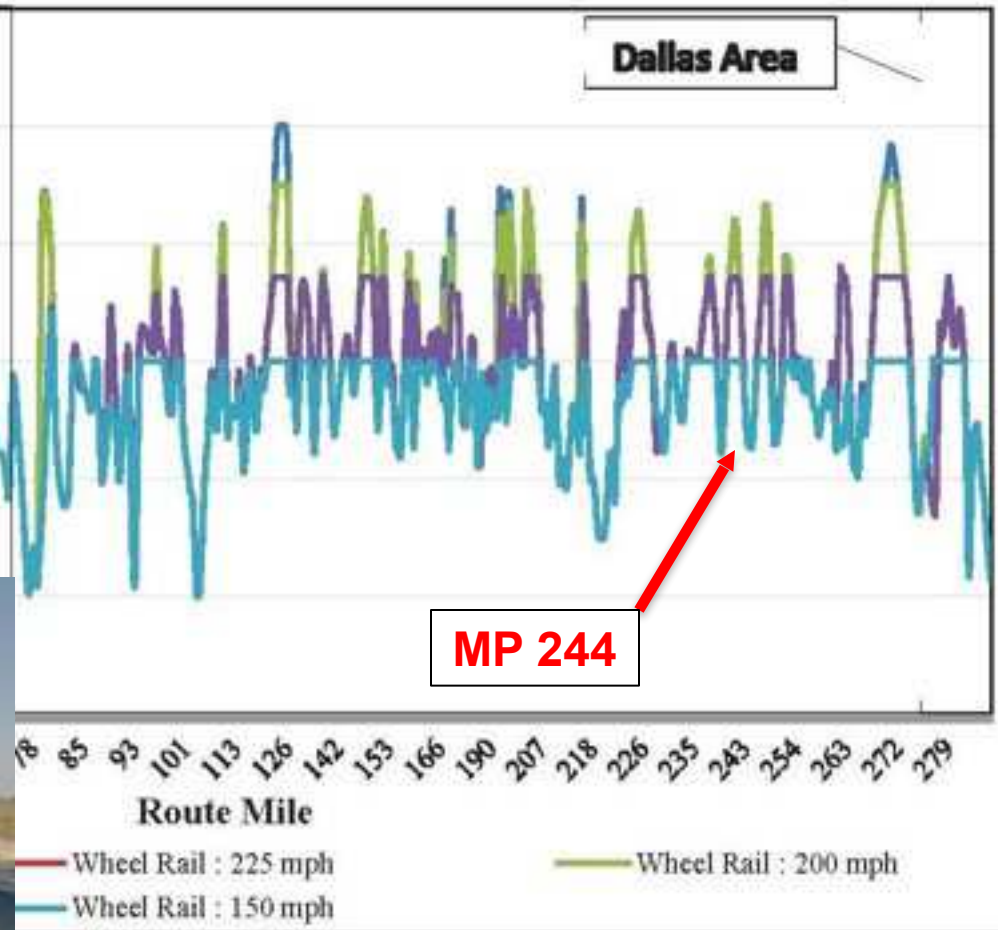


Figure 57. Operating Speeds of the Wheel Rail Technology on the IH 45 NB corridor

- FHWA/TX-13/0-6698-1 “Examining Use of Public Rights of Way for High Speed Rail and Freight Transportation”, August 2013



veston -Dallas Corridor : Wheel Rail Technology



Wheel Rail Technology on the IH 45 NB corridor

Acceleration, Braking, and Curves

Typical Speed Profile

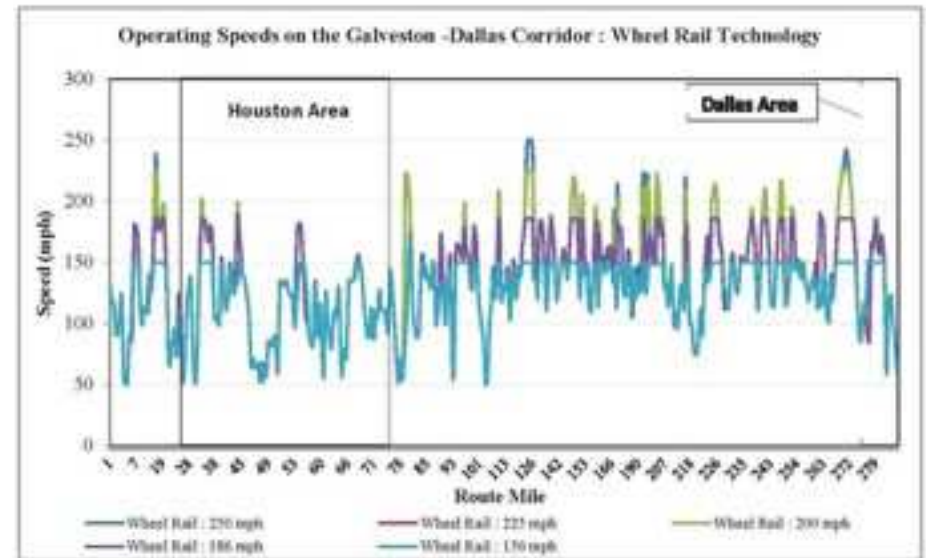
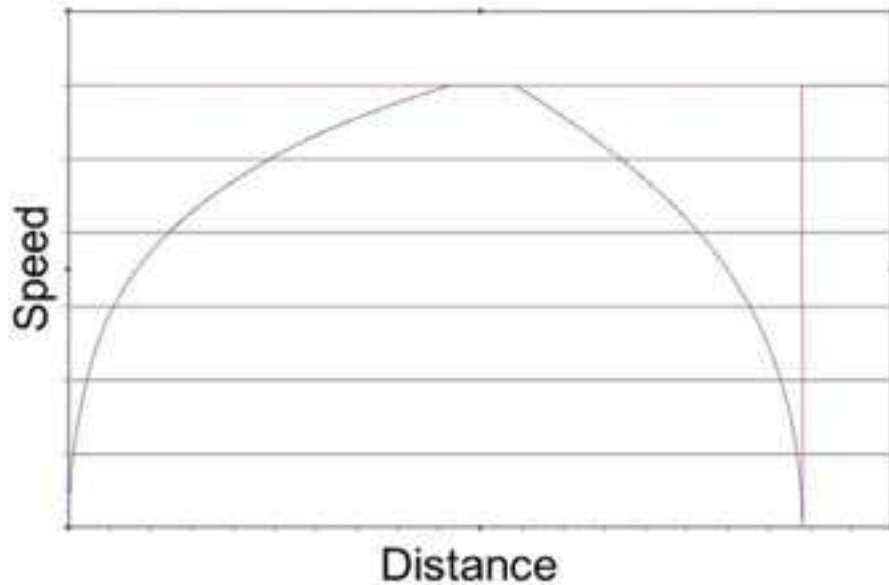


Figure S7. Operating Speeds of the Wheel Rail Technology on the IHI 45 NB corridor

Eye Candy For Those That Like Rail



























Thank You!

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