MxV Rail

U.S. Department of Transportation

Federal Railroad Administration

MxV Rail (formerly TTCI)
Pueblo, Colorado USA
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Special Trackwork Innovations & Implementation

Duane Otter, Scientist

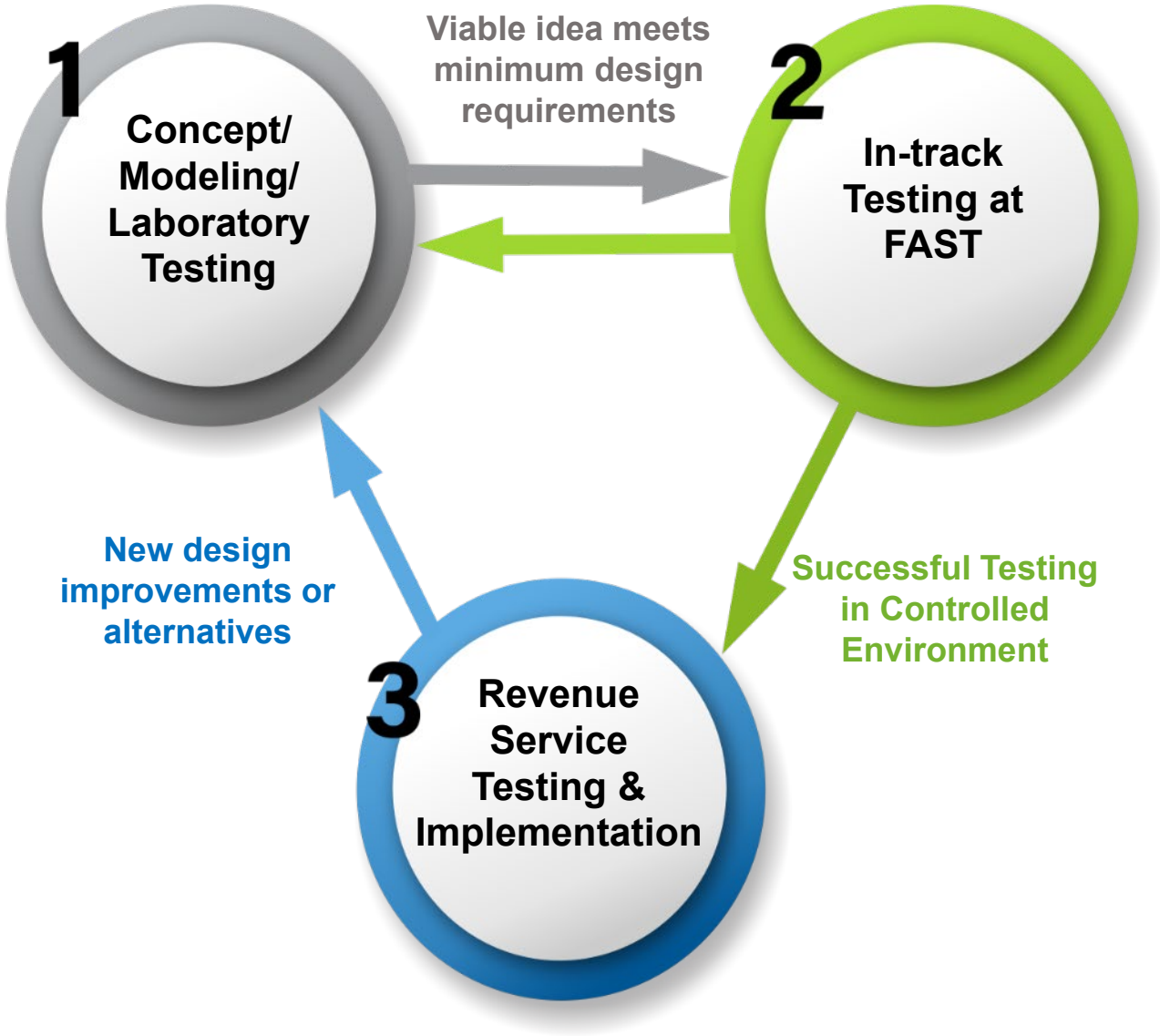
Overview

- Implementation process
- Improved insulated joints
- Flange-bearing frogs
- Continuous mainline rail turnouts
- Pads for special trackwork
- Summary

Special Trackwork Implementation Goals

- Improved safety
- Improved reliability
- Increased component life
- Reduced maintenance

Implementation Process



MxV's Role in the Implementation Process

- **Accelerate safe implementation of new technologies via:**
  - FRA waiver support
  - Economic analyses
  - Revenue service monitoring of implementation

Insulated Joints (IJs)

- IJ life in 2004: 200–250 MGT
- Standard IJ life in 2019: ~500 MGT
- Premium IJ life in 2019: ~1,000 MGT

Insulated Joints (IJs)

- **Large number of IJs tested in revenue service**
- **Primarily on BNSF main line in New Mexico**
  - Heavy traffic
  - High-speed intermodal
- **Participation by multiple suppliers**
- **Annual inspections**

Design	Number Tested	Description
Center Liner®	68	Butt joint, 48-in. bars, non-epoxied insulation near center
High-modulus Bars	28	Butt joint, 36-in. bars, forged and wider in center
Ceramic End Post	15	Butt joint, 36-in. bars, experimental epoxies
Short Angle Projection™	9	Lapped joint, rails do not have point slopes
Long Angle Projection™	18	Lapped joint, rails have point slopes
Keyed	12	Butt joint, mechanical keys between rails and bars

IJs

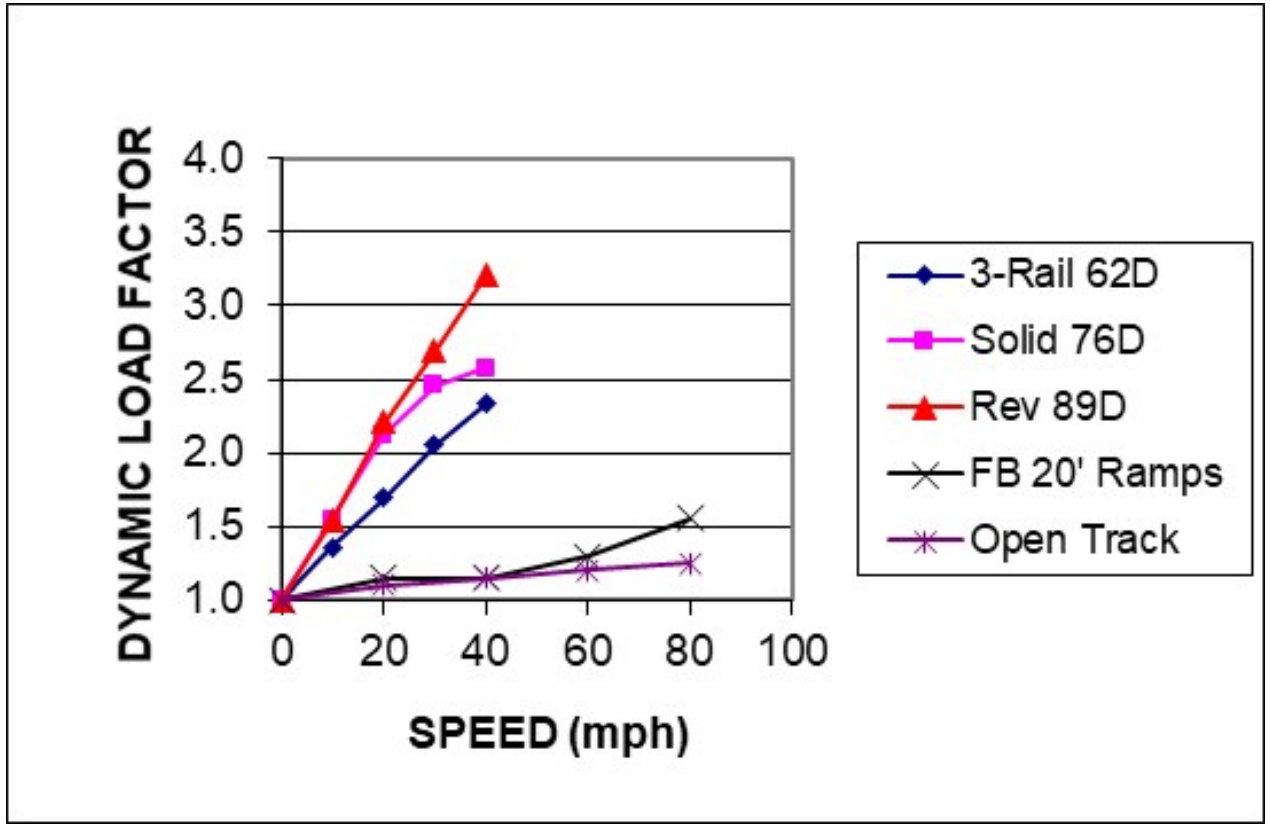
Type	Predicted Median Life Range (MGT)
Center Liner®	684–889
High-modulus bars	526–1,081
Ceramic End Post	467–730
Short Angle Projection™ Joint	433–TBD
Long Angle Projection™ Joint	357–650
Keyed	359–561

Flange-Bearing Frog (FBF) Crossings

- TTCI annual monitoring of five FBF crossings in support of FRA waiver
- Annual monitoring of wheel removals related to flanges
- First waiver diamond on CSX at Shelby, OH in 2006
- Annual update reports to FRA
- Provided support for Part 213 rule change in 2020

FBF Crossings

- **Advantages:**
  - Reduced dynamic forces compared to conventional crossing frogs
    - Reduced tamping demand
    - Reduced weld repair demand
    - Fewer speed restrictions
    - Life often exceeding 300 MGT



FBF Crossings

- **Disadvantages:**
  - Still searching for better wear bar materials
    - Hardest materials suffer brittle fractures
    - Tougher materials wear too quickly
  - Changing wear bars requires track window
    - Significant disassembly and reassembly necessary

FBF Crossings

- **OWLS (One-Way, Low-Speed) flange-bearing crossing diamonds**
  - Used for a low-speed, low-volume line crossing a mainline
  - Several hundred installed
  - 10 mph on low-speed route
    - Some operated at 15 mph under FRA waiver

FBF Crossings

- **Five FBF locations monitored for FRA waiver:**
  - Christopher, IL (BNSF/CN)
  - DT Junction, CA (BNSF/UP)
    - 15 mph OWLS
  - Lamar, MO (BNSF/M&NA)
  - Milano, TX (BNSF/UP)
  - Moorhead, MN (BNSF/BNSF)
- **About 45 full FBF crossings in service in the U.S.**

Flange-Bearing Lift Frogs

- Mainline rail is continuous
- Diverging route is tread and flange bearing
- Used for low-volume, low-speed diverging traffic turnouts
- Several thousand installed since mid-2000s
- Benefits: Increase in service life (>100% over RBM at FAST)

Continuous Mainline Rail Turnouts

- **Vertical Switch**
  - No gaps or joints in mainline rails
  - Points lift wheels over main line rail for diverging route
  - Flange-bearing lift frog
  - Intended for low speed, low traffic on diverging route

Continuous Mainline Rail Turnouts

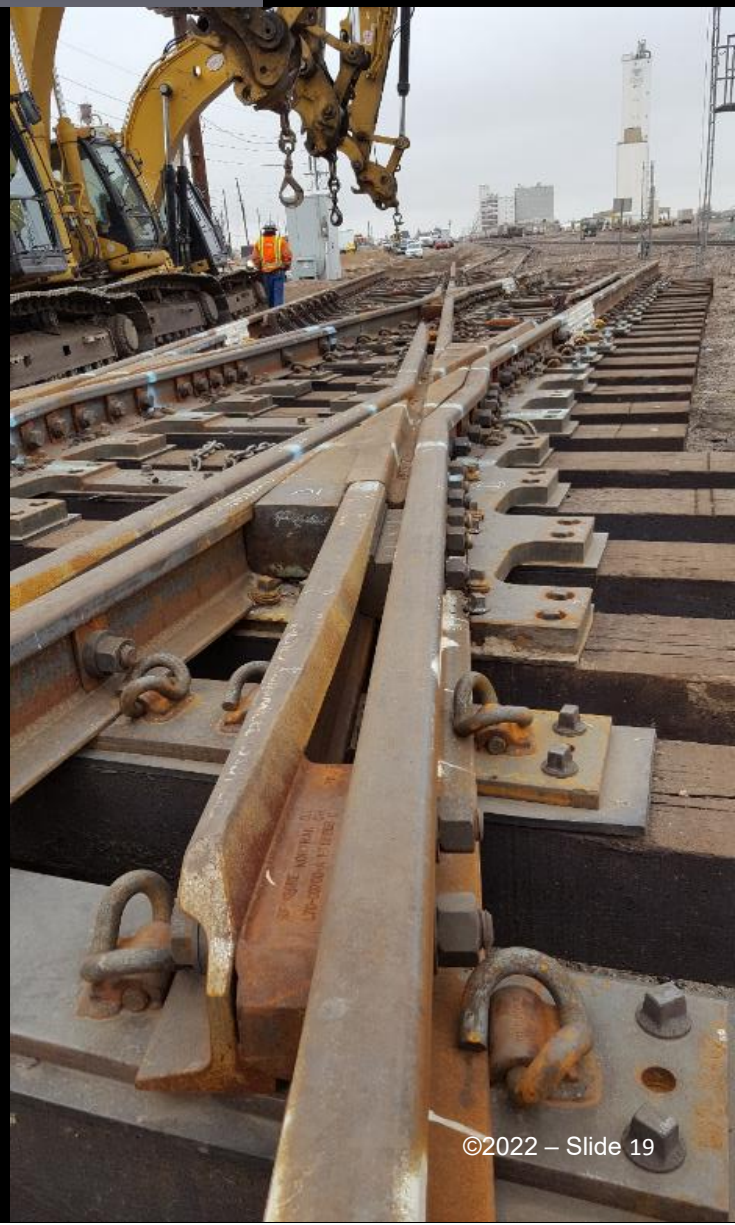
- About 20 now in service on BNSF
- TTCI annual monitoring of CMRT for several years
- Original is in revenue service after initial testing at FAST
- Life depends on diverging traffic
- Need to be properly adjusted

Pads for Special Trackwork

- **Successful testing at FAST indicates potential for:**
  - Reduced dynamic forces
  - Increased component life
  - Reduced surfacing maintenance
- **Pad locations:**
  - Under tie
  - Under base plate
  - Between base plate and rails or castings

Pads for Special Trackwork

- **Pads becoming common for crossings**
  - Under tie and under plate pads most common
- **Under-tie pads for turnouts successfully tested at FAST**



Summary and Conclusions

- **Continued improvements in special trackwork result in:**
  - Improved safety & reliability
  - Improved component life
  - Reduced maintenance
- **Ongoing implementation**
  - Lift frogs – thousands
  - OWLS – hundreds
  - Full FBF crossings – 30+
  - Vertical switches – <30
  - Engineered pads – just getting started

Acknowledgements

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Federal Railroad Administration

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