BNSF Rail Safety Overview

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Who and What We Are.....

• 32,500 Miles of Track, 44,000+ employees
• Operating in 28 States, 3 Canadian Provinces
• Over 8,000 Locomotives
• Operating approximately 1,600 trains per day
• 2016 – 1.370 Million Hazardous Material Shipments
• 2018 Capital Investment of $3.4 Billion
• **BNSF can move 1-ton of freight approximately 500 miles on 1-gallon of fuel**
Since 1980, railroads reduced rates for employee injuries, train accidents and grade crossing collisions by **80%**

In 2017 BNSF moved hazardous materials **99.999%** of the time without an accidental release

Fissile materials are a very small percentage of the traffic handled by rail. Currently:

- 0.0029% of all hazmat

-0.00023% of all shipments
BNSF’s Safety Overview

- Rail is the safest mode of land transportation.
- BNSF’s safety vision is to prevent accidents in the first place.
- BNSF has a broad-based risk reduction program.
BNSF vs. Industry Reportable Rail Equipment Incident Rate (Incidents per Million Train Miles)

Source: FRA – Rpt 1.12  As of Dec. 31, 2017
Prevention: Causes for Derailments

BNSF REPORTABLE TRAIN ACCIDENT CAUSES - 2017

- Human Factor: 49%
- Track/Signal: 25%
- Equipment: 10%
- Misc.: 16%
**Prevention: Risk-Reduction Efforts – Layers of Safety**

- **Risk Identification**
  - **Risk ID**: Proactively determine and prioritize sources of risk
  - **Design-In Safety**: Engineer out risk during equipment, facility and process design
  - **Rules & Procedures**: Set rules and procedures, culture of compliance and accountability
  - **Safety Information**: Align efforts and communicate key messages to all levels
  - **Approaching Others About Safety**: Develop people to ID, address and respond to exposure

- **Incident & Injury Prevention**
  - **Emergency Planning & Response**: Reduce severity and impact

- **Incident & Injury Response**
  - **Re-enactment**: Reduce severity and impact

**Sources of Risk**: Incident
Prevention: Reducing Risk

Human Factor
- Training
- Remote monitoring
- Positive Train Control
- Self reporting protocol

Equipment/Mechanical
- Ultrasonic inspection
- Detector network - dragging equipment
- Technology
  - Thermal/infrared scanning for warm bearing detection

Track/Signal
- Enhanced track inspection training
- Continued elimination of jointed rail
- Strong capital program for tie renewal
- Technology - ground penetrating radar and enhanced geometry testing
BNSF’s Capital Investments

- Replacement Capital
- Expansion
- PTC
- Locomotive

$ Billions


$2.3 $1.9 $2.1 $2.0 $2.6 $3.1 $3.8 $3.4 $3.4 $3.3 $2.7 $3.6 $3.6 $4.0 $5.5 $5.8 $3.9 $3.3 $3.4
Bridge and Track Inspections

- BNSF conducts regular, rigorous track, weather event, bridge and rail defect inspections
HAZMAT INSPECTIONS

To determine if a HAZMAT shipment is in acceptable condition for transportation, the Federal Railroad Administration (FRA) requires all loaded and residue/empty HAZMAT shipments be inspected at these certain points:

✓ Before accepting the shipment from the shipper.

✓ When receiving them in interchange.

**Note:** Run-through trains received in interchange may continue to the next inspection point before being inspected.

✓ When placing shipment in a train.

✓ At other points where an inspection is required (e.g., 1K/1.5K mile inspection).
Prevention: Equipment Detection Technology

- More than 4,000 trackside detectors
- Hot Box Detector (HBD)
- Wheel Load Impact Detector (WILD)
- Trackside Acoustical Detector (TADS)
- Sonic Cracked Wheel/Axle Detector (CWAD)
- Machine Vision Systems
- Magnetic Particle Inspection
- Warm Bearing Detection System (WBDS)
- Hot Wheel Detectors (HWD)
- Truck Performance Detectors (TPD)
Prevention: Rail Equipment Detector Examples

Acoustic Bearing Detector (ABD)

Hot Box Detector (HBD)

Cracked Wheel/Axle Detector (CWAD)
Prevention: Key Train Operations

A Key Train has one or more loads of Spent Nuclear Fuel/High Level Radioactive Materials, Toxic Inhalation Hazard/Poisonous Inhalation (TIH/PIH) materials or a train with 20 or more tank loads of any hazardous materials.

Special Handling for Key Trains

- **Speed restrictions**
  - BNSF requires a speed of 35 mph for all Key Trains through municipalities of 100,000 or larger as of March 2015
  - 50 mph for all Key Trains as of July 2014

- **Special identification and tracking**
  - Risk-based Routing
  - Key Train Routes
  - Parked and Secured Trains
  - Locomotive Cab Securement
BNSF has installed the PTC infrastructure on all **88 required subdivisions**, covering more than **11,500 route miles** and **80 percent** of our freight volume.
• **Rail transportation route analysis.** For each calendar year, a rail carrier must analyze the safety and security risks for the transportation route(s) using 27 safety and security factors for the primary route and secondary routes (172.820)

• **Lessons learned**
  – Best track
  – Shortest route
  – Avoiding populations is not normally possible
Rail Routing of SNF

Typical Steps -

• Obtain origin, interchange and destination locations
• Carrier runs the Risk – Route Model using the 27 factors
• Reviews results with DOE and DOT
  – Tests between the Railroad and DOE model seem to have similar routes.
Why Dedicated Trains

• Equivalent weight distribution / train handling
  – Standard freight car 100 ton = 286,000#
  – SNF Car 125 ton >400,000#

• Less handling
  – Fewer switches
  – No classification

• Best available technology can be utilized
Performance Standard for Spent Nuclear Fuel Trains (S-2043)

• Includes all cars in the trains including buffer cars, security cars
• Requires static and dynamic modeling before construction
• Requires full scale characterization, static, and dynamic testing of each car and the train
• Roadworthiness exceeds standard freight car requirements
  – Enhanced performance trucks
On-Board Monitoring Systems

- Location Determination
- Truck Hunting
- Wheel Flats
- Braking Performance
- Vertical, Lateral, Longitudinal acceleration
- Bearing Condition
- Speed, Ride Quality
Schematic of SNF Train

Defect detection (all cars) including:

- Truck hunting, rocking, wheel flats, bearing condition, ride quality, braking performance, vertical lateral, and longitudinal acceleration