Inspection & Maintenance of Spring Rail Frogs

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Spring Rail Frog
Importance of Inspection

- **Safety**
  - Prevents derailments
    - If spring is not tight enough or force is not strong enough, the wheel can easily take the incorrect route over the frog

- **Maintenance**
  - Provides a perspective of the maintenance that needs to be performed on the frog to prevent failure
  - Get the most life out of the spring frog
Tools for Inspection

- Tape measure
- Taper Gauge
- Grease gun
- Lubricant and/or brush
- Tension testing device
  - BNSF uses Joules Tool
Monthly Inspection Requirements

- Complete visual check
- Perform clearance checks
- Check spring wing opening and fit
- Lubricate
Visual Check

- Check positive stops
  - Prevents spring wing gap from opening too wide
  - Check for wear on the stops
  - On older spring rail frogs
    - Stops were welded on in the field to meet standards
    - Visually check welds for fatigue cracks
- Inspect welds on hold downs and spring box(es)
Clearance Checks

Wing Rail
- Identify wheel transfer area from frog to spring wing
- Spring wing must not be more than 1/4” higher than the frog
  - May cause derailments during trailing point mainline movements
Clearance Checks

- Hold downs: Bottom Clearance
  - For older spring frogs
    - Bottom horn clearance is 1/8” maximum and 1/32” minimum
  - Newer spring frogs
    - Open at the bottom, no shims
    - Measurement is not needed

- Horn must be centered in housing
Clearance Checks

Hold Downs: Top Clearances
- The top of the horn housing clearance is 3/16” maximum and 1/16” minimum
  - If UHMWPE wear plates under the horn, 1/16” clearance at the top is not necessary
- FRA standards for the clearance between the hold down housing and the horn should not be greater than 1/4”
Check Spring Wing Opening

Methods for measuring opening
- Place a jack in the throat of the frog
- Measure with a tension testing device

Jack the spring wing open
- Check stops
- Opening gap measured 4” behind the frog point
- Opening gap measurement should not be less than 1 7/8” and not greater than 2 1/8”
Lubricate

- With spring wing open
  - Place wood block in opening
  - Lubricate
    - Between frog and spring wing
    - All plates, horns, and hold downs
  - Clear debris by sweeping
- UHMWPE
  - Do not need lubrication, sweep out debris
Check Spring Wing Fit

- Check fit
  - Check all spring wings for tight fit against the frog
- Inspect frog point for excessive overflow
- Inspect railhead of the spring wing and frog point for outer wheel edge contact
Causes of Contact with Railhead

- Treadwear
  - Replace the frog

- Vertical movement in wing rail
  - Remove material from the bottom of the base of the wing rail and the top of the base plate
  - Caused by ice, snow, or debris

- Movement between the hold down housing and the horn
  - Adjust the hold down housing
Quarterly Inspection Requirements

- Measure the spring wing rail force
- Measure the spring house tension
- Observe retarder is functioning, if equipped
Spring Wing Rail Force

- BNSF Approved tester J&A tester
- Place tester in the throat of the frog
  - Ahead of the point and between the spring wing and the fixed rail
Application of J&A Tester
Spring Wing Rail Force

- Begin pumping the handle to open the wing rail
- Initial movement
  - 500-600 lbs on the pressure gauge
- Continue pumping until the wing is open
  - 3,000-4,000 lbs on the pressure gauge
- Inspect gap, clean out and lubricate
Spring Force Tension

- Use J&A tester
- Attach black shoe to tester with provided wrench
- Place the tester over the spring with the shoe end closest to the rail
Spring Force Tension

- Begin pumping handle
- Initial movement
  - 500-600 lbs on the pressure gauge
- Not required to test the spring at full compression
  - Can determine if spring is problem when wing is not closing properly, cannot test with metal sleeve
  - 1,400-1,700 lbs on pressure gauge when compressed
Retarder Inspection

- Available on #15, 20, 24 frogs
- Allows trains to take the diverging route of a turnout at speed
- Proper closing time of wing rail between 30 seconds and 3 minutes
  - Depends on temperature and wear
Retarder Inspection

- Two methods
  - Watch a train make a trailing point move
  - Force the wing rail open with a jack

- Time limits
  - 3 seconds to 3 minutes does not apply
  - Retarder needs to close
  - Faster in hot weather because it is a hydraulic system
Retarder Inspection

- Closes too quick (slaps back)
  - Limit operating speed to 20 mph through turnout
  - Replace the retarder

- Retarders need to be changed out frequently
Maintenance of Spring Rail Frogs

- Preventative Grinding
- Welding Repairs
- Replacement
- Track Conditions
Preventative Grinding

Frequency
- Initial Grinding
  - Trains will harden frog with time
- 2 weeks, 6 weeks, 12 weeks
- As conditions warrant
  - Surface rail of the frog will wear, it will compress and flow leading to undesirable conditions
Conditions that Require Grinding

- Wheel contact with gage corner of the rail
  - Produces a lip on the gage side of the rail
- Wheel contact with the machined out depressions
  - Creates metal flow on the gage side of the secondary point and the gage and field side of the spring wing rail
Conditions Lead to . . .

- Chipping of the flow
- Wheel flange picking the point
- Derailment
Requirements for Grinding

- Removal of the overflow lip and reestablishment of the proper radius
- Slotting
Welding Restrictions

- Permitted on long and short point rails
- Not permitted on the spring wing rail or the fixed wing rail
Conditions Requiring Welding Repair

- Primary frog point batter
- Depressions or loss of a smooth surface
- Repair of cracks
- Repair of chipped out sections of the frog
- Shelling or Spalling
- Failure of previous weld repairs
Replacement Criteria

- Rail in the frog is defective
- Frog with a bolt hole defect or head web defect
- Extent of head checking and length of head checking is severe
Replacement Criteria (cont.)

- Flangeway depth cannot be maintained for the length of the flangeway
- Repair would be difficult to properly perform in track
- Amount of time required to repair in track would be extensive
General Track Conditions

- Tie conditions
- Surface conditions
- Anchor application
- Plate conditions
- Drainage
- Joints
Conclusion

- Proper inspection determines maintenance needed
- Proper maintenance increases the safe operation of trains and the life of the frog
References

- Spring Frog Inspection Video, BNSF Railway Co
- Track Welding: Rules and Procedures, BNSF Railway, Ch 5, 14.
- Engineering Instructions, BNSF Railway, Ch 2, 9.