Why flange bearing frogs?

Advantages of flange bearing frogs:
- Reduced risks
- Reduced impacts
- Reduced maintenance
- Reduced damage to lading
- Reduced wear on rolling stock
- Reduced wear on rail and track components
- Reduced overall impact on the ballast and sub-grade
What does flange bearing mean?
What are the current restrictions?

FRA Track Safety Standards, Section 213.137(d), currently states:

“Where frogs are designed as flange-bearing, flange-way depth may be less than that shown for Class 1 if operated at Class 1 speeds.”
Current types of flange bearing frogs:

- Lift / Jump frogs
- Combination tread and flange bearing frogs
- One Way Low Speed (OWLS) crossing frogs
- Full flange bearing crossing frogs
Lift frog
Lift or Jump frogs are selected by Roadmasters for use in appropriate location.

Typically utilized where diverging traffic is minimal such as a set-out track or lightly used industry track.

Diverging traffic is limited to FRA Class 1 speed.

No guard rail is required on the straight side.

It is important to shim / taper the diverging running rail to facilitate proper truck steering.

BNSF currently has about 100 lift frogs installed.

Continued strong demand for this frog.
Lift frog standard plan drawing

NOTES:
1) USE IS RESTRICTED TO A SET OUT TRACK OR OTHER Seldom USED MAIN TRACK APPLICATION.
2) MAX SPEED THROUGH TURNOUT SIDE IS 10 MPH.
3) GUARD RAIL NECESSARY FOR TURNOUT SIDE ONLY.
4) LIFT FROGS ARE LEFT AND RIGHT HANDED.
5) BNSF PART NUMBERS LISTED BELOW INCLUDE FROG, 3 GAUGE PLATES AND GUARD RAIL.
6) INSTALL SIGN "CAUTION HYRAIL VEHICLES LIFT FROG". BNSF PLAN 325701.
7) NOT TO BE INSTALLED ON CURVES.

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Combination tread & flange bearing frogs
Combination tread & flange bearing frog

Why a combination frog?

Consider the following.........
Existing SMSG frogs
(Solid Manganese Self Guarded)

Advantages:
- No guard rails
- Low cost
- 90° joint rails can be replaced easily

Disadvantages:
- Impacts at toe and heel
- Broken bolts
- With 90° joint = chipped heel rails
- Chipped manganese
- Failed plates
- Plate cut ties
Existing RBM frogs
(Rail Bound Manganese)

Advantages:
- Low impact heel
- Conformal frog shape (body and wing)
- Frog gauge plates
- Manganese casting that can be replaced

Disadvantages:
- RBM life
  - Cost initially and on-going
  - Train delays for weld repairs
  - Maintenance replacement
- Wing rail and frog tip wear
- Concentrated load at transition from wing rail to point area
- Repairs in track
Rolling contact at theoretical point of frog is based on a new wheel compared to the maximum wear allowed on a used or worn wheel:

- 5” wheel tread
- The false flange impact on the wing rail is significant:
  - Wing rail false flanging occurs 3.75” to 4.50” from the flange-way
  - Ultimately resulting in “death by impact loads”
- Adequate flange-way that is 1-7/8” wide and 1-7/8” deep

So, this has pointed us toward……………………
Combination tread & flange bearing frog

- Combination tread & flange bearing frog:
  - Ideal for use in Class 1 yard tracks
  - Takes advantage of wheel wear variation
  - With new frog all wheels will be flange bearing, as frog wears (flange-way groove):
    - New wheels primarily tread bearing
    - Worn wheels primarily flange bearing
    - More worn wheels than new wheels in service
  - Impacts reduced over the life of the frog
  - Ultimate life of frog is enhanced
Installation of #9 SMSG combination tread & flange bearing frogs

- September, 2009, installed three combination frogs at Lafayette, LA
- Flange supported initially
- Will wear into a combination flange and tread bearing frog
- 10 mph maximum speed on the yard lead
- Same universal tapered rail design is installed at both the toe and heel
Combination tread & flange bearing frog

NEW, ALL WHEELS WILL BE FLANGE BEARING
IT IS ANTICIPATED THAT THE GROOVE WILL DEVELOP EARLY
Combination tread & flange bearing frog

As the groove deepens and depending on the flange height, there will be a combination of...
Evidence of tread and flange bearing

Note false flange contact
Tapered toe of frog
Heel of frog
Combination tread & flange bearing frog
One Way Low Speed crossing frog (OWLS)
One Way Low Speed crossing frog (OWLS)

- Low speed route is limited to FRA Class 1 speed
- High speed route is whatever track is capable of handling
- Ideally suited for locations where a low speed, low traffic volume line crosses a higher speed line
- Impacts on the high speed route are essentially eliminated
  - Grooves will develop in running surface of higher speed route and welding may be required
- BNSF currently has 22 OWLS crossing frogs installed
- OWLS were a springboard toward use of the full flange bearing frog
Running surface of OWLS crossing frog
One Way Low Speed crossing frog (OWLS)
Full flange bearing crossing frog
Standard tread bearing crossing frog
Full flange bearing crossing frog

- Advantages include reduced impact, wear, welding and maintenance
- Ideally suited for locations where two higher speed routes cross
- Currently allowed for use only in conjunction with an FRA waiver that requires close observation:
  - On-foot visual inspections
  - Monitoring of rolling stock
  - Detailed reports to FRA
- Broader use is currently under consideration by FRA
- Allows for maximum authorized speed on both routes
- Life cycle cost is expected to be less than a conventional crossing frog with flange-way gaps
Freight car wheels in flange bearing
Locomotive wheels in flange bearing
Full flange bearing crossing frogs in service
Summary of plans for reduced impact frogs

- Flange bearing frogs are currently limited to use in Class 1 track due to FRA flange-way restriction
- Lift or Jump frogs are selected by Roadmasters for use in appropriate location and demand on BNSF is strong
- BNSF future Class 1 frogs will be combination tread and flange bearing for use, primarily, in yards
- Low impact heel and toe rails for use with manganese frogs have resulted in savings-to-date on BNSF
- OWLS (One Way Low Speed) crossing frogs have been very successful on BNSF
- BNSF will continue to press for broader use of the full flange bearing crossing frogs
- BNSF invites industry participation in development and testing of low impact frog designs and technology
A tread bearing frog at rest............