

Crosstie & Fastener Experience

BNSF Railway

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Industry Changes

Goal Remains The Same - Safe & Reliable Infrastructure

BNSF Railway

Created on Sept. 22, 1995 with the Merger of the BN & ATSF

Acquired by Warren Buffett on Feb. 12, 2010 and became part of the Berkshire Hathaway Family

32,500 Route Miles Primarily in the Western 2/3 of the US, 28 States & 3 Canadian Provinces

160 Plus Years Old Company Comprised of over 390 Predecessor Roads

CB&Q Aurora Branch Feb. 12, 1849



BNSF By the Tie Numbers - Mains

76,000,000 Wood Ties

11,000,000 Concrete Ties

50,000 Composite, Steel, and Other

**In total approximately 12,500,000 Concrete Ties Installed.
(Concrete Ties Used in New Yard Tracks & Others
Retired)**

**Concrete Tie Installations have ranged from 140,000 to
850,000 per year. The near term outlook is reduced and is
expected to be in the lower range.**

Wood Tie Replacement between 2.5M – 3.5M per year.

Wood Ties

19 1/2" spacing

7" x 9" x 8'-6"

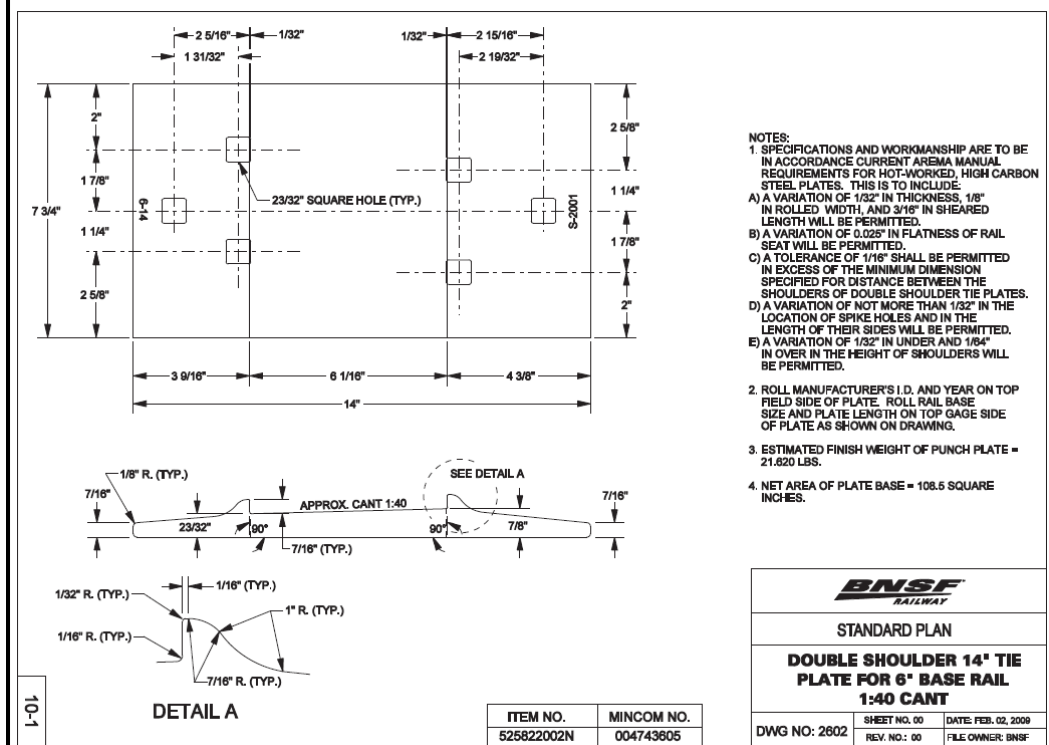
Cut Spikes

Unit V Common Anchor

Curve block all curves,
every 3rd tie

14" BNSF plate

Step and Half Treating
Process (6 lbs creosote
and 1 lb borate)



10-1

ITEM NO.	MINCOM NO.
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Composites

Continued testing by our TR&D Dept and field trials.

5,000 tie install on the Bayard Sub.

Best Practice to Predrill.



MRT (Maintenance Replacement Tie)

Field trials – “Flexible” Italian made Concrete Ties which behave like wood ties.

For use as maintenance / replacement ties to intersperse with wood ties. Testing on the Powder River Division.

Main Issue – Variable Gage.



Concrete Ties Placement

Determining Concrete Tie Locations

Plan for installation of concrete ties in existing track as follows, exceptions must be approved by Director Roadway Planning;

Curves \geq 2 degrees, 30 minutes

Curves \geq 2 degrees with minimum 1% grade

Curves \geq 2 degrees with 70-mph or greater speeds

Middle track of at least 3-MT territory where both track centers are \leq 18-feet and ties are due for mechanical replacement

Curves with chronic gauge deviations

Rail and tie cycles are due concurrently to warrant concrete tie installation

Create plans for islands of wood where ties are due and other P811 projects are planned nearby.

- Wood tie islands are defined as less than or equal to 3100 feet in length. Wood tie islands greater than 3100 feet must be approved by DRP
- Wood tie islands are within two years of planned mech tie cycle
- Wood tie islands that require less than or equal to one mobilization day to reach location. Mobilization days greater than one day must be approved by DRP.

Refer to EI 27.3.1 for installation instructions involving tangent segments.

Concrete for concrete on severely worn shoulders and/or 20%+ failed shoulders and/or repeat base gage defects

Milestones

BNSF past Concrete tie experience

- **Lead Line (new construction) 1968**
- **Eldorado Line Change 1979**
- **Wendover, Crawford, Leonia 1986**
- **Increased foot print and capacity 1992 -2004**
- **MRT – Interspersed Concrete 2002**
- **Increased Capacity / Center Bending 2014**
- **SKL Dowel Reinforcement 2016**

Fastening History

Fastenings

- **PR601 1979**
- **E-clips 1986**
- **Safelok I 1987**
- **Vossloh 2008 to Current W40**
- **Amsted 2013 to Current ME63**

1st Known SKL Fastener in N. America

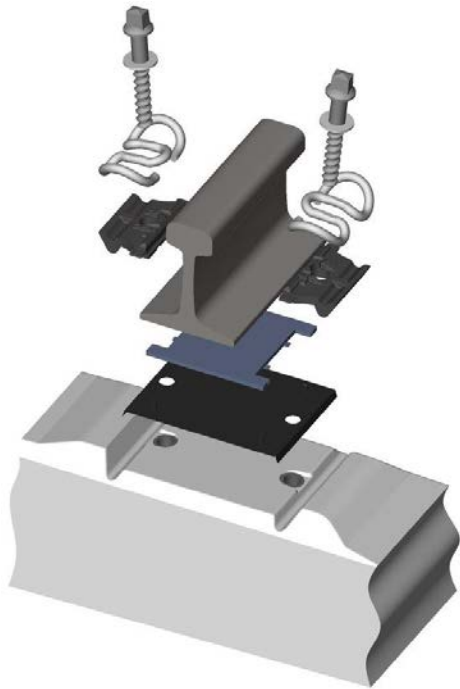
UPRR – Dragoon, AZ - 1987 C1053, 2-D curve, 30MGT DBL TRK



Why SKL Fastening?

SKL standard guide plate has 225 percent increase in bearing area beyond Safelok: 58mm vs. 130mm

BNSF's SKL field guide plate is 190mm that is a 328 percent increase in surface area from 58mm Safelok insulator.



Why SKL Fastening?

Preload of the SKL fasteners at the ROCLA tie plant

No “spidering” for de-stressing – Less labor intensive.

Lag screw does not bear side load

Lag screw and insert can be replaced

Derailment-damaged clips and lags can be replaced

Clips can not be over driven

Clips have a rotation stop

Reduced “insulator” wear

Safelok preloading is limited to clip- and tie-pad sets

Small crew must replace clips and handle a few insulators

Insulator is 58mm wide

Insulators are replaced as necessary

Shoulder takes the entire load

Shoulders wear

Clip and shoulder damage normally result in tie replacement

Clips can be over driven

Clips do not have a drive stop

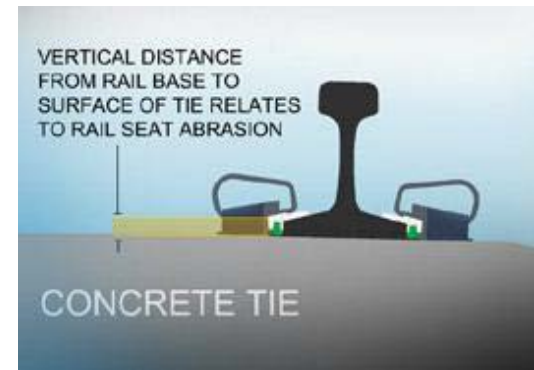
RSD – Inspection and Repair

In addition to hy-rail inspection and geometry car trips, Aurora looks specifically for RSD

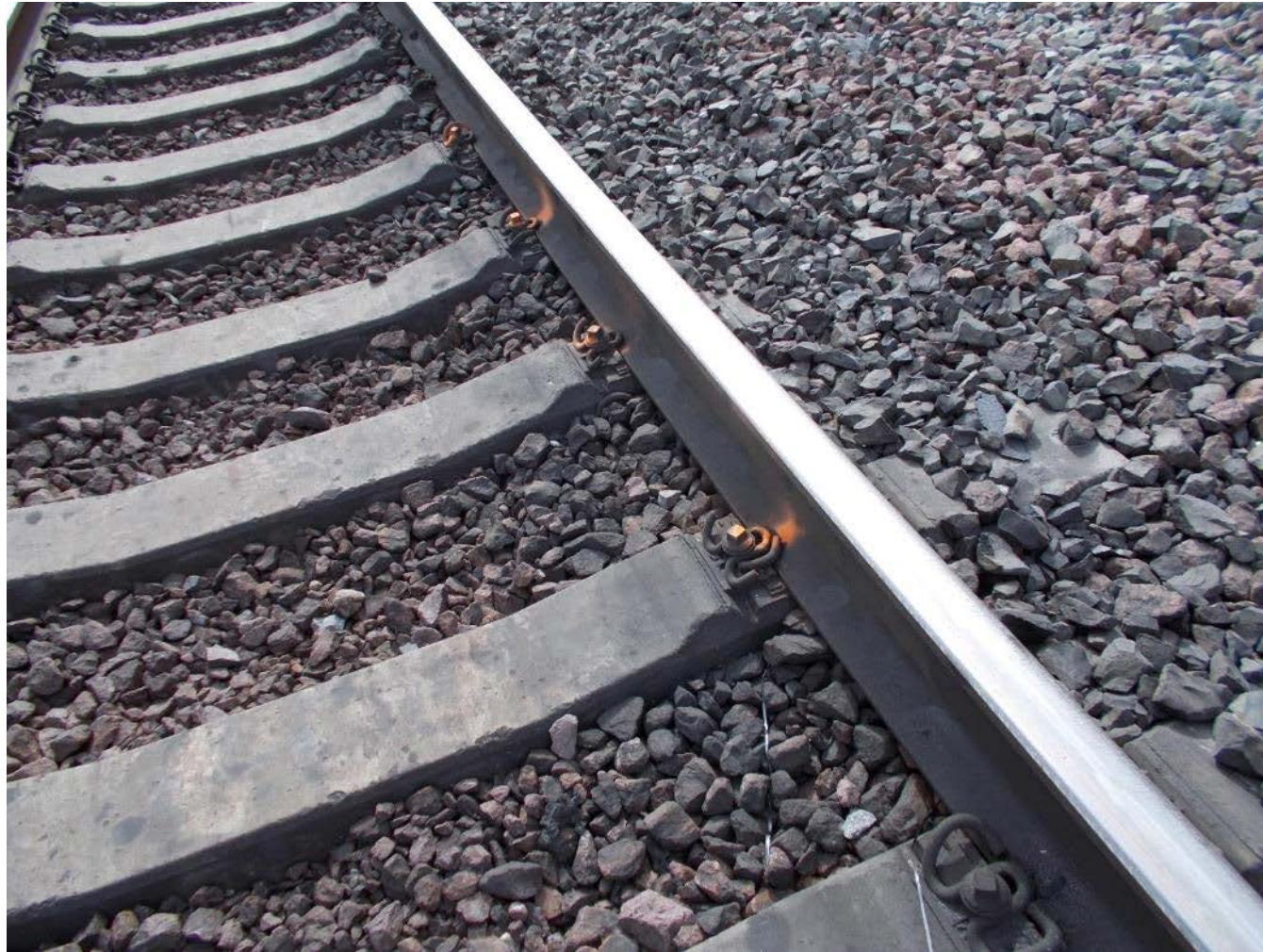
Aurora provides accurate hy-rail inspection capability of RSD on concrete ties

- Able to travel at 30mph
- Optically measures difference between the base of the rail and the top of the tie to determine the differential between the two
- Accurate to 1/32”
- This differential correlates directly to RSD

Annual 175 to 250 Linear Miles of Repair



Broken Clamps (Prior Generation) Cajon Pass



Fouled Ballast Conditions

Snow Shed - Montana



Tie Splitting – Dowel Reinforcement



Guide Plate Wear – Extreme Condition



Field side Insulator Wear 1/4 of an
Inch

Broken Lags - Cajon Pass Testing Lubricant in 2016



Rail Seat Abrasion

11/64" Abrasion 1st generation SKL fastener Ties Montana 2008 Install.



Center Negative - Redesign 30% Improvement



Ballast Mat, Pecos River Bridge – Ft. Sumner, NM

This segment of double track will be completed by this summer leaving 4 miles of single track left to complete. (2,200 mile route between Chicago and LA) Concrete ties were laid across this bridge yesterday.



TLM Consist



IGR Ties – Pecos River Bridge

Rocla IGR Ties @ Pueblo



Padded Ties – Insulated Joint Panels



Concrete Tie Turnouts

Evaluating new concrete turnout designs:

5 turnouts installed in 2015 including a double #24 x-over at Noel, OK on the Southern Transcon



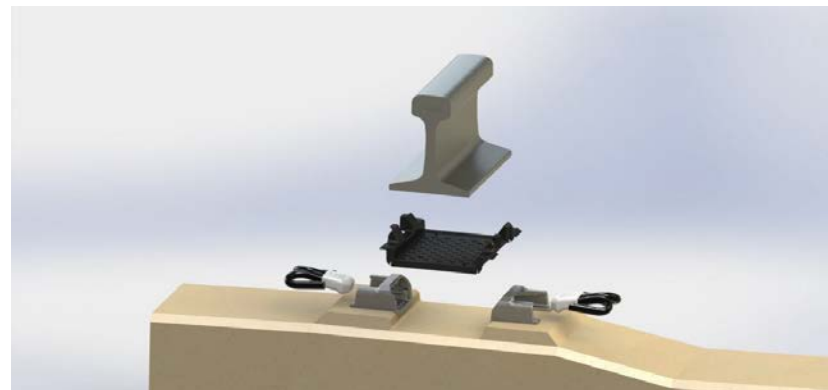
Two Part Insulator Safelok I

1. Test product in 2015
2. Improved post wear performance, less breakage.
3. Develop product with a snap in side post for less handling.



Continue to Evaluate New Designs

Pandrol Fastening Right
GIC Tie Below



New Track Installation -TLM Track Laying Machine



In Track Replacement P811s



Track Lifter (TLU)



Challenge – Disposing of Old Ties



Future Plans

Wood remains the tie of choice for most applications. Will continue to dual treat ties (creosote & borate) for longevity. Transition to normalized replacement.

Concrete is most effective for new track construction, severe grade / curvature, and heavy tonnage lines. Will continue to use this type of tie in these applications. Test padded ties / or bridge decks for homogenous tie territories

Continue to test and use composites as price and performance improve. Manufactures are now able to make a consistent product which has been difficult in the past due to inconsistent recycled raw material streams.

Continued Improvement For a Safe & Reliable Infrastructure



The image features a blurred train moving from left to right across the frame, set against a sunset sky. The BNSF Railway logo is prominently displayed in the center. The logo consists of the letters "BNSF" in a large, bold, white sans-serif font, with a registered trademark symbol (®) to the upper right. Below "BNSF" is a thick white horizontal bar that tapers at both ends. Underneath this bar, the word "RAILWAY" is written in a smaller, white, italicized sans-serif font. In the background, a railway signal tower with two lights (one green, one red) stands on the left, and a small structure is visible in the distance. The foreground is a dark, gravelly surface.

BNSF[®]
RAILWAY