PII

RAILWAY

PII
Engineer 1 Lab & Testing Services
Technical Research & Development

BNSF Railway Company
1011 N.E. River Road
Topeka, KS 66616
100 N.E. Jefferson Trfwy, Spot 24
Topeka, KS 66616
PII

October 14, 2010

Project ID: 2010100401 (revised UT section)

Andrew Callahan – Alliance

Subject: Number-3 wheelset off of BN 534967 involved in a derailment at Crawford, NE on 9/25/2010, Accident ID: PR-0910-106

The analysis of the failed axle which was received at the Technical Research and Development Physical Test Laboratory on October 1, 2010 has been completed. The report follows.

Visual Examination

The number-3 wheelset off of BN 534967 with a broken axle between the wheels was received, see Figure 1. The following information was taken from the wheelset:

Axle Ends	SSD1102 2A1 E 0912 F	YMW P
Locking Tab	BNCX R RBXK 04-09	
Hub	05BNSF09	
Wheel Info.	66260 03 08 GT C CH36	66392 03 08 GT C CH36

The axle was manufactured by Standard Steel Division in November 2002, see Figure 2. The current wheels and bearings were mounted on the axle by BNSF Railway in May 2009 and installed under BN 534967 in June 2009.

Examination of the fracture faces revealed a large void, which originated during the manufacturing process, in the center of the axle, see Figures 3 and 4. The void covered approximately 15 percent of the fracture face and was located approximately 27-inches from the end of the axle. Multiple fatigue origins (ratchet marks) grew from the void, indicating the void was the cause of the axle failure. The fatigue grew to 60 percent of the cross section before rapid brittle fracture of the remaining 25 percent.

High Impact Wheels

The wheel history of the car was researched using the wheel impact load detector (WILD) data. No impacts exceeding 90 kips were found for car BN 534967 from the time when the wheelset was installed under BN 534967 in June 2009 until the failure on September 25, 2010. The impact history for this time period was graphed and can be seen in Figure 5.

Ultrasonic Testing Discussion

In the 1998 issue of the AAR Manual of Standards and Recommended Practices for Wheels and Axles, which was in affect at the time this axle was manufactured, it states that ultrasonic testing of all axles is required, see below.

17.0 ULTRASONIC TESTING IS REQUIRED FOR ALL HEAT-TREATED AXLES

17.1 Time of Inspection

Inspection shall be made after axle ends are machined and centered, but prior to drilling the cap screw holes.

The void in this axle should have been detected at the time that it was ultrasonically tested and the axle should not have been placed in service.

Conclusion

This axle failed due to the large void in the axle body. This void was a manufacturing defect which should have been detected during the ultrasonic inspection at the manufacturing plant.

The wheelset will be retained until notified differently by the BNSF law department. Please contact PII with any questions.

PII

Cc: PII - Topeka
– Topeka
Fort Worth
Fort Worth
– Fort Worth
h – Fort Worth
rt Worth
– Fort Worth
Fort Worth
– Fort Worth
y – Fort Worth
emus – Alliance
- Alliance
- Fort Worth

PII t – Topeka
- Fort Worth
– Fort Worth
- Fort Worth
ort Worth
– Fort Worth
- Fort Worth
- Fort Worth
- Fort Worth
– Fort Worth
Topeka
- Alliance
- Fort Worth

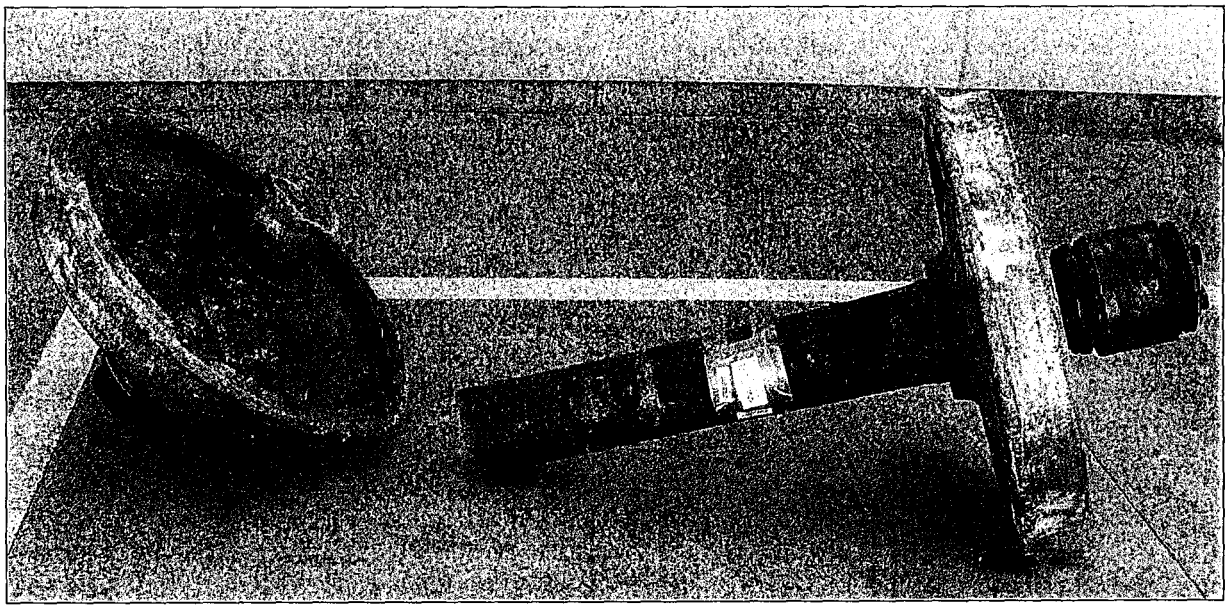

Figure 1: Number-3 axle off of BN 534967 as received.

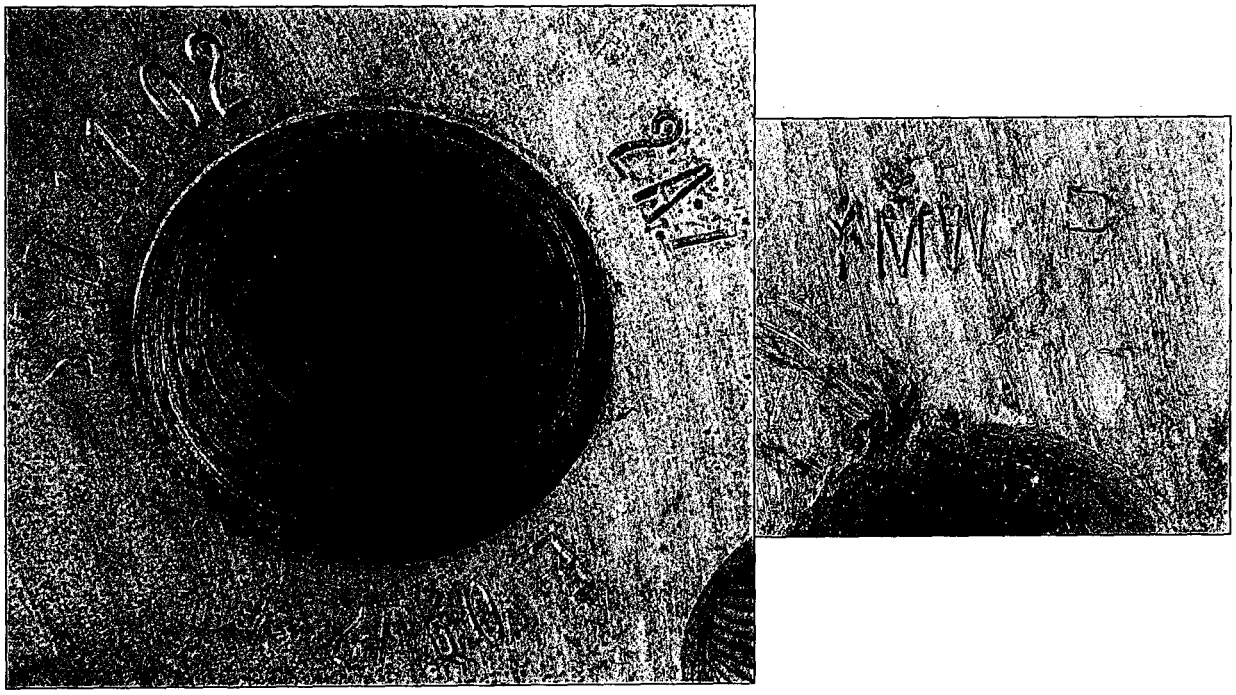

Figure 2: Stamped information taken from the axle ends.

Figure 3: Fracture face view taken from the long axle end. Ratchet marks pointing to the void as the failure origin (yellow arrows).

Figure 4: Fracture face view taken from the short axle end.

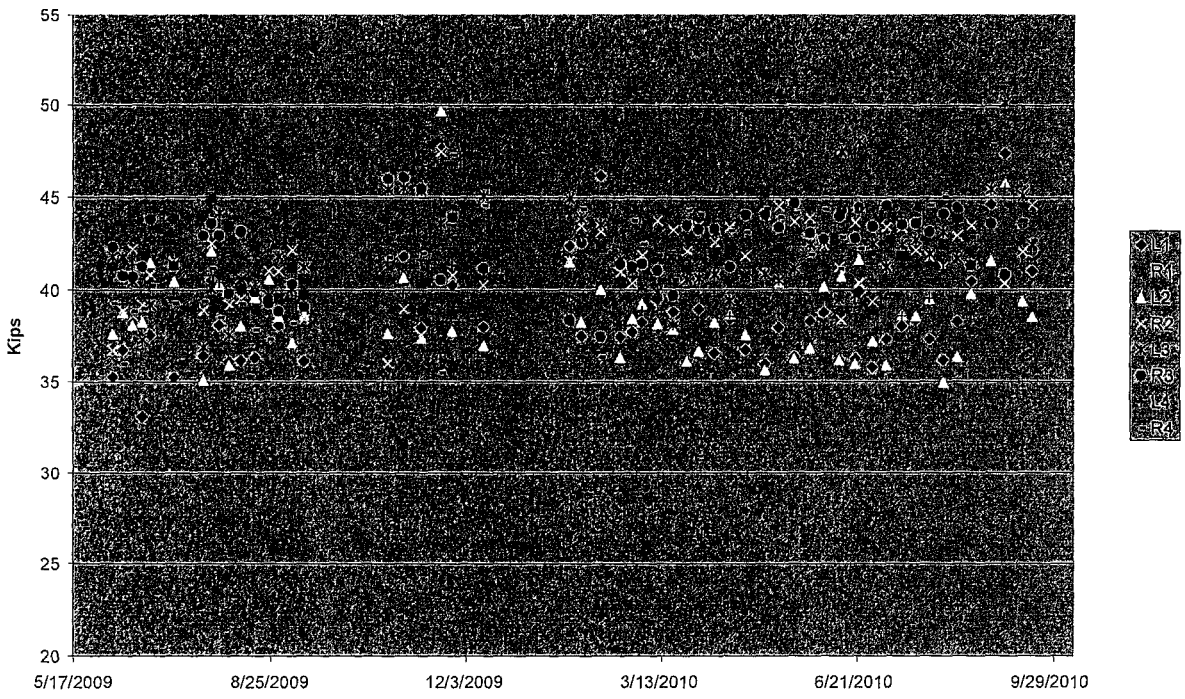

Figure 5: Loaded wheel impact data for BN 435967 from June 2009 to September 25, 2010