National Transportation Safety Board

Office of Railroad, Pipeline and Hazardous Materials Investigations

Washington, D.C. 90594

Rear End Collision of Two BNSF Trains near

Red Oak, Iowa

April 17, 2011

DCA 011 FR 002

Mechanical Group Factual Report

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Accident Summary

On Sunday April 17, 2011 at approximately 6:55 a.m. (CDT) an eastbound Burlington Northern Santa Fe Railway Company (BNSF) coal train collided with the rear end of a standing BNSF maintenance of way equipment train near Red Oak, Iowa. The accident occurred at milepost 448.3 on the number two track on the Creston subdivision of the BNSF Nebraska Division.

The coal train was designated as C BTMCNM0 26A, BNSF 9159 East. It consisted of 130 loaded coal cars, drafted 18,509 tons, and was 7,122 feet long with two locomotive units on the head end and one locomotive on the rear end. The maintenance of way equipment train was designated U BRGCRI5 15G, BNSF 9470 East and consisted of 21 loaded cars and 13 empty cars, drafted 2,617 tons and was 3,170 feet long with one locomotive on the head end.

As a result of the collision, the two head end coal train locomotive units derailed along with the head two coal cars. The locomotive crew cab of the striking train was damaged and involved in a subsequent diesel fuel fire. Seven additional coal cars were also damaged but not derailed. Ten cars of the standing maintenance of way train were derailed. Both the engineer and conductor on the coal train were fatally injured. The two crew members on the locomotive of the maintenance of way equipment train were not injured. Preliminary damage estimates are $7.6 million but do not include the monetary damage to the bridge. The weather at the time of the accident was reported as 5 miles visibility with mist at Red Oak airport which is about two and one half miles east of the accident location.

Train Consists

C BTMNCNMO 26A consisted of two locomotives units at the head end, 130 loaded coal cars and one remote locomotive unit at the rear of the train. The train weighed 18,509 tons with 142.5 tons per operative brake and was 6901 feet in length.

U BRGCR15 15G consisted of one locomotive unit at the head end and 34 cars; 21 loaded and 13 empties that weighed 2617 tons with 77.5 tons per operative brake and was 3,096 feet in length. The loaded cars were transporting various types of BNSF track maintenance equipment.

Damages

BNSF estimated monetary damage to be:

Damage to coal train	$1,157,482
Damage to MOW train	$195,411
Damage to MOW train lading	$5,140,000
Damage to track	$898,593
Wreckage removal and clean up	$875,386
Miscellaneous labor costs	$79,288
Damage to highway bridge	$380,000
Total Damages	**$8,726,151**

Post Accident Inspections

On the morning of April 18, 2011 the cars from C BTMNCNMO 26A were given a Class 1 mechanical inspection at its point of rest by the Mechanical Group. Three minor exceptions were taken: the pedestal roof liners on car DEEX 5492(R4) and DETX 457(R4) were out of place and there was a broken composition brake shoe on DEEX 990507(L1). Compressed air was supplied from the locomotive unit that had been on the rear of the train at the time of the accident. The brake pipe was charged to 90 pounds per square inch (psi) and after the air had stabilized a 20 psi reduction was made. The brakes on all 130 cars applied as designed.

In the afternoon on April 18, 2011 the cars that were not derailed from U BRGCR15 15G were given a Class 1 mechanical inspection at its point of rest by the Mechanical Group. The nine rear cars had been damaged or destroyed in the collision. The brakes on the cars that were inspected applied and released as designed. Three minor exceptions were taken to the mechanical condition of the cars that were inspected: BNSF 927164 sill step bent (AR), BNSF 927052 both end hand holds missing (B-End) and BNSF 927055 both end hand holds missing (A-End). The missing and bent safety appliances did not appear to have been as a result of the accident.

Control Positions

The lead locomotive unit (BNSF 9159) had sustained severe crush and thermal damage during the collision and subsequent fire. The control positions on the engineer's side of the operating compartment could not be physically verified. There was also extensive damage on the conductor's side but the mechanical group observed that the conductor's valve had not been activated.

BNSF provided the following specifications for the alerter on the BNSF 9159:

A.5. Alerter

A.5.a. Alerter: Integrated in LSI system display screens.

Rev B

A.5.a.a. One whisker switch is provided as an alerter reset switch located on the Engineer's workstation. (Part of H.2.a)

A.5.a.1. In addition, an alerter light indicator will be shown on the flat screen display. The light indicator in the LSI system shall be equipped with a visual digital count timer in the window (elapsed time). The window shall be red per AAR. An alerter alarm is provided by the FIRE Screen Unit.

A.5.b Alerter system is enabled by any of the following: (Part of H.22)

- Locomotive movement (speed > 0.5 mph)

- Release of the independent brake (brake cylinder pressure < 25 psi)

A.5.c. Alerter is provided with twenty five (25) second time delay, audio and visual warning starting at twenty seconds. No alerter cutout is to be provided.

No time delay provided for safety control brake applications.

(Part of H.22')

The reset times are as follows:

Speed Less than or equal to 40 MPH

Reset Time = 120 Seconds

Speed greater than 40 MPH

Reset Time = 120*(40/Actual Speed) Seconds

A.5.d. Alerter system control will be inhibited from any the following conditions: (Part of H.23)

- Brake cylinder pressure greater than 25 psi, or

- The automatic brake handle in suppression or beyond, or

- Brake pipe pressure is below 20 psi, or

- Air brake system set up for trail cut out service, or.

- The status of the locomotive is Distributed Power remote, or

- Whenever in slow speed control

When all of the following are true:

- Reverser is centered

- Isolation Switch Position = Isolate

- Throttle Position = Idle

- Speed < 2.0 MPH

- Generator Field Switch Position = Open

- FIRE has valid communication with EM2000

A.5.d.1. Whenever the alerter is inhibited for any reason, the next time the alerter becomes active the timing sequence should go immediately to a timed countdown warning (visual indication on screen illustrating the timed countdown). If the alerter is then reset and remains active and the timing goes to the normal intervals described above.

A.5.e Alerter system control will be reset from any of the following: (Part of H.23)

- Throttle changes (Idle, TH 1-8)

- Direction changes (Forward, Reverse)

- Operation of Engineer's Horn

- Operation of Engineer's Bell

- Dynamic Brake changes

- Safety Control (Alerter) reset switch

- Movement of the Automatic or Independent Brake handles

- Application or release of Bail Off

- Pressing any FIRE System Function Display key

A.5.e.2. - Manual Sanding

A.5.f Alerter system control will NOT be reset by the following: (Part of H.23)

- Operation of Conductor's Horn/Bell

- Engineer's Radio Microphone

- Conductor's Radio Handset

A.5.g The event recorder must indicate when a penalty brake application was made due to the alerter.

A.6 Overspeed

Rev D

A.6.a Train overspeed limit set for 75 mph and warning speed set to 73 mph. Variable speed setting capability being included as part of display screen and established through the display screen.

The default setting must be adjustable without software change.

Part of E.19

A.6.b. Train overspeed limit with 10 second time delay with a visual screen display indication and an auditory warning alarm (will be a part of the display system). Suppression shall not be provided. Overspeed may be prevented by placing ABV in any position other than Release and Charging.

A.6.c. Train overspeed limit set to the speed and time delay stated above includes visual warning. No overspeed cut out is to be provided. No parameter/password provided or made available for railroad personnel to change overspeed limit.

Stopping Distance

The Federal Railroad Administration (FRA) arranged for a braking distance simulation, under emergency and normal braking conditions, with Sharma & Associates, Inc. an engineering consultant firm. The simulation model was based on a train with the same locomotive distribution, horsepower, car total, length, weight, braking ratios for locomotives and cars, brake pipe pressure and pneumatic venting capabilities as the C-BTMNCNMO 26A. Further, the simulation was performed on the track profile the C-BTMNCNMO 26A was operating over prior to the collision.

With a braking ratio of 9% the simulated results indicate a stopping distance from an emergency application of 542 feet; with a braking ratio of 8.5% an emergency application stopped the train in 615 feet.

The normal braking simulation employed incremental throttle reduction, a minimum service application from the automatic air brake system, locomotive brake bail-off, full service application after 30 seconds, throttle to idle below 10 miles per hour (mph) then continue until stopped. The simulation indicated the train would have stopped short of the signal location.

Collected Physical Evidence

The FRA crash hardened data memory module from the lead locomotive, BNSF 9159, was located and successfully removed. In addition, the fire computer was removed. The computer was in poor condition due to exposure to fire.

Personal effects were collected from the damaged control compartment of BNSF locomotive unit 9159.

Pre Accident Inspection

BNSF records indicate on the morning of April 18, 2011 at 3:06 a.m. qualified BNSF car inspectors completed a Class 1 brake test and a mechanical inspection on C-BTMNCNMO 26A

with no defects reported. BNSF had designated this train "extended haul" which requires a written record of the air brake test be "PLACE(D) ON CONTROL STAND OF LEAD LOCOMOTIVE IN PLAIN VIEW OF ENGINEER." Much of the interior of the control compartment of BNSF 9159 had been thermally damaged in the accident but a written record of the air brake test was on file at the location where the test had been administered.

A review of the maintenance and inspection records for BNSF 9159 indicated all the required Federal Railroad Administration and BNSF inspections were current. BNSF 9159 was a diesel-electric model SD70ACE, six-axle, 4,300 horsepower, locomotive unit that had been built by EMD in 2008. The unit was equipped with CCB2 air brake equipment. There were no unrepaired defects that would have rendered the unit unfit for road service including exhaust fumes leaking into the control compartment. The last three crew-reported defects were all for "non compliant water cooler".