NATIONAL TRANSPORTATION SAFETY BOARD OFFICE OF RAILROAD, PIPELINE & HAZARDOUS MATERIALS INVESTIGATIONS WASHINGTON, D.C. 20594

RAILROAD SIGNAL & TRAIN CONTROL GROUP FACTUAL REPORT OF INVESTIGATION

Head-on Collision between

Eastbound Train S-LACLPC 1-26 and

Westbound BNSF Train Q-CHISBD 6-27

In Panhandle, Texas on

June 28, 2016

DCA16FR008

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A. ACCIDENT

Type:	Head-on Train Collision
Date and Time:	June 28, 2016 at 8:21 a.m. CDT
Location:	MP 525.6 Panhandle Sub-division Panhandle, Texas
Carrier:	BNSF Railway
Train #1:	Eastbound Freight Train BNSF S-LACLPC 1-26
Train #2:	Westbound Freight Train BNSF Q-CHISBD 6-27
Fatalities:	3
Injuries:	1

B. SIGNAL & TRAIN CONTROL - INVESTIGATIVE GROUP

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P-1 Aerial view of impact of eastbound BNSF S-LACLPC1-26 and westbound BNSF Q-CHISBD6-27

Panhandle Texas. June 28, 2016

C. ACCIDENT SUMMARY

On Tuesday, June 28, 2016, at approximately 8:21 a.m. central daylight time (CDT), two BNSF Railway (BNSF) intermodal trains collided about MP 525.6 on the BNSF's Panhandle

Subdivision. Each train was crewed by a locomotive engineer and a conductor. Eastbound train S-LACLPC1-26K, consisting of three head-end locomotives, two distributive power locomotives, and 56 loaded cars collided with westbound train Q-CHISBD6-27L, consisting of five head-end locomotives and 54 loaded cars. The westbound train was routed into the siding at milepost 526.1. The collision occurred about one-half mile east of the east switch of the siding at milepost 526.1. Investigators examined the east switch of the siding at milepost 526.1 and observed a run through switch condition.

As a result of the collision and derailment there was a significant fire. Three crew members were fatally injured in the accident. The engineer of the westbound train jumped before impact and survived with minor injuries.

This area of the BNSF Panhandle Subdivision utilizes a Centralized Traffic Control System which is controlled by a dispatcher in Kansas City, Kansas which is without an active Positive Train Control system. No passenger trains operate through this territory.

BNSF has reported initial damage estimates of $16 million dollars, this estimate includes $12 million in car and equipment, $3.5 million in lading, and about ½ million dollars in track and signal damage.

The general weather conditions at the time of the accident were daylight, 74F°, clear skies with visibility of 10 miles, and 6-12 mph shifting wind.

Parties to the investigation are the Federal Railroad Administration (FRA), BNSF Railway (BNSF), the International Association of Sheet Metal, Air, Rail, and Transportation Workers (SMART), and the Brotherhood of Locomotive Engineers and Trainmen (BLET).

D. DETAILS OF THE INVESTIGATION

1. Description and Method of Operation of the BNSF Panhandle Subdivision

The Panhandle Subdivision is part of the BNSF Kansas Division extending from MP 238.0 near Wellington, Kansas to Eastern, MP 550.5 near Amarillo, Texas, in a timetable east-west direction. The maximum authorized speed on the subdivision is 70 mph for freight trains with permanent speed restrictions between posted timetable mileposts. In the vicinity of the accident area, the BNSF operates trains over two main tracks with sidings utilizing a Traffic Control System designated as (CTC)[1] Centralized Traffic Control. Additionally, train movements on the Panhandle Subdivision are governed by operating rules and timetable instructions.

1. The BNSF defines CTC as a block system that uses block signal indications to authorize train movements.

2. Description of the Railroad Signal System

2.1 BNSF Panhandle Subdivision Signal System

The Railroad Signal System on the Panhandle Subdivision consists of a CTC system arranged for movements in both directions on both main tracks. The Panhandle Subdivision dispatcher is located in Kansas City, Kansas.

In the vicinity of the accident area, the BNSF operates trains over two main tracks with passing sidings utilizing CTC system. The wayside signal equipment consists of wayside color light type signals, US&S M23 power switch machines, and electronically coded track circuits. The system is designed with approach lighting to illuminate automatic signals within the block.

The CTC System in the vicinity of the accident uses a dispatcher to control movement and to line routes for train movements. Coded track circuits are used to detect train occupancy and effect signals within the block. Westbound train movements into the block are governed by the West Bound Control Signal 5232 located at Milepost (MP) 523.20. Eastbound train movements into the block are governed by the East Bound Control Signal 5261 (End of siding on Main 1 only) located at MP 526.10.

2.1A Planned PTC Installations

The Panhandle Subdivision is planned for installation of active Positive Train Control (PTC) in November 2016. The wayside signals have functional WIU (wayside Interface units) that communicate to the BNSF NOC (Network Operations Center). At this time all power switch positions and signal aspects are monitored and recorded.

3. Post-accident Signal Event Recorders

The data from the dispatcher's control console event recorder was retrieved along with the wayside event recorders from all signal locations, defect detectors, and Highway-Rail Grade Crossing Warning Systems in the accident area.

3.1 Wayside Signal & Dispatcher Train Management Dispatcher System(TMDS) Event Recorder

Table-1 The following is summary of the TMDS & wayside signal field event recorders.

Time	Direction	Location	Event	Aspect
8:01:44 AM	WB	CP5232	1WEST MAIN 1 SIGNAL LINED	YELLOW / RED
8:01:48 AM	EB	CP5314	1 EAST MAIN 1 SIGNAL LINED	YELLOW / RED
8:01:49 AM	WB	INT 5201	1 WEST MAIN 1 SIGNAL LINED	FLASHING YELLOW / RED
8:01:55 AM	EB	INT5332	1 EAST MAIN 1 SIGNAL LINED	FLASHING YELLOW / RED
8:03:33 AM	EB	CP5289	1 EAST MAIN 1 SIGNAL LINED	YELLOW / RED
8:03:36 AM	EB	CP5314	APSECT CHANGE	FLASHING YELLOW / RED
8:03:41 AM	EB	INT 5332	ASPECT CHANGE	GREEN/ RED
8:03:58 AM	WB	CP5261	POWER SWITCH LINED REV	RED/RED
8:04:00 AM	WB	CP5261	1 WEST MAIN 1 SIGNAL LINED	RED/YELLOW
8:04:05 AM	WB	CP 5232	ASPECT CHANGE	FLASHING YELLOW / RED
8:04:08 AM	WB	INT 5201	ASPECT CHANGE	GREEN/ RED
8:09:09 AM	WB	INT 5201	Q-CHISBD OCCUPIES EAST TRACK	GREEN/ RED
8:10:22 AM	EB	INT 5332	S-LACLPC OCCUPIES WEST TRACK	GREEN/ RED
8:12:39 AM	EB	CP5314	S-LACLPC OCCUPIES WEST TRACK	FLASHING YELLOW / RED
8:14:18 AM	WB	CP5232	Q-CHISBD OCCUPIES EAST TRACK	FLASHING YELLOW / RED
8:15:03 AM	EB	CP 5314	S-LACLPC OCCUPIES OS AT CP 5314	N/A
8:15:25 AM	EB	CP5289	S-LACLPC OCCUPIES WEST TRACK	YELLOW / RED
8:17:34 AM	WB	CP5232	Q-CHISBD OCCUPIES OS AT CP 5232	N/A
8:17:39 AM	EB	CP5289	S-LACLPC OCCUPIES OS AT CP 5289	N/A
8:17:50 AM	EB	CP5261	S-LACLPC OCCUPIES WEST TRACK	RED/RED
8:17:58 AM	WB	CP 5261	Q-CHISBD OCCUPIES EAST TRACK	RED/YELLOW
8:20:10 AM	EB	CP5261	S-LACLPC PASSES EB RED/RED STOP SIGNAL	RED/RED
8:20:10 AM	WB	CP5261	WB SIGNAL GOES RED/RED FOR TRAIN QCHISBD	RED/RED
8:20:15 AM	EB	CP5261	S-LACLPC RUNS THROUGH POWER SWITCH IN REVERSE POSITION	RED/RED
8:20:59AM	WB	INT5253	COLLISION FOULS MAIN TWO	

3.2 Defect Detectors

In addition to wayside signal data, downloads were obtained from defect detectors encountered by the eastbound S-LACLPC1-26K and the westbound Q-CHISBD6-26. Table 2 summarizes the data from the hot bearing and dragging equipment detectors.

Location	Train	Defects
MP 560.6	SLACLPC-126K	0
MP 548.0	SLACLPC-126K	0
MP 503.0	QCHISBD6-27	0
MP 523.0	QCHISBD6-27	0

Table 2. *Data from defect detectors for trains SLACLPC-126K and QCHISBD6-27 retrieved from the remote monitoring BNSF mechanical desk.*

3.3 Highway Grade Crossing Warning System

In this area of the BNSF Railway, Panhandle subdivision multiple highway-rail grade crossing warning systems are in use. Of these eight highway/rail grade crossing warning systems only three are located with clean approaches. The remaining five have approaches that are dependent on adjacent equipment for warning system start. Recorded train speeds at these locations are fractional of the total warning time. One of the three highway-rail grade crossing warning systems with a clean approach is located at MP 529.57, west of the point of collision. This warning system is controlled by a Safetran GCP 3000, grade crossing predictor. The second and third warning systems are located east of the point of collision and are located at MP 525.13 and MP 524.21. The crossing at MP 525.13 is controlled by a Safetran GCP 3000 and the crossing at MP 524.21

is controlled by a Harmon HXP-3 grade crossing predictor. The data logs from the three highway/rail grade crossing warning systems were downloaded. Table 3 summarizes the data from the Highway Grade Crossing Warning Devices

Location	Train	Warning time	Train Speed
MP 529.57 - County Road K DOT #014581R	S-LACLPC1-26K	34 Seconds	70 MPH
MP525.13 County Road O DOT# 014576U	Q-CHISB06-27L	37 Seconds	33 MPH
MP 524.21- County Road 12 DOT #014575M	Q-CHISB06-27L	31 Seconds	39 MPH

Table 3 *Data from County Road K, County Road O, and County Road 12, Highway Grade Crossing Warning Device*

4. Post-Accident Signal System Examination and Testing

The post-accident inspection found all signal equipment and associated signal appurtenances secured with no indications of tampering or vandalism.

Signal aspects were verified, shunt tests, ground tests and operational tests of the signal system were completed. Lamp voltages were measured and found to be adequate with no exceptions noted. An accident simulation using track shunts and local control of the control points was conducted to ensure signal system integrity. No exceptions were noted during the post-accident examination or testing. Additionally, a Sight distance test was conducted on July 2, 2016 at the approximate same time to include signal preview of both East and Westbound signals. The team aboard both test locomotives stated that all of the signal aspects were well illuminated, aligned and in focus. The following two charts are the results of the signal preview test.

The following are the test results as measured by a survey crew (contracted to BNSF) utilizing a global positioning system (GPS) device[1]:

Signal Preview Distances for the Eastbound S-LACLPC Stack Train

Table -4 Signal Preview Test Eastbound

Signal Indication and Aspect	Preview Location	Signal Location	Distance in Miles	Distance in Feet
Clear Green/ Red	534.673	533.867	0.806	4258
Approach Medium Flashing Yellow/ Red	532.805	531.582	1.223	6460
APPROACH Yellow/Red	529.813	528.882	.931	4918
STOP Red/Red	527.024	526.194	.83	4383

Signal Preview Distances for the Westbound Q-CHISBD Train

Table-5 Signal Preview Test Westbound

Signal Indication and Aspect	Preview Location	Signal Location	Distance in Miles	Distance in Feet
Clear Green/Red	517.642	518.065	0.423	2235
Clear Green/Red	519.742	520.546	.804	4245
Approach Medium Flashing Yellow/ Red	522.573	523.107	.534	2818
Diverging Approach Red/Yellow	525.398	526.089	.691	3650

1 The GPS device provided corrected milepost data that will be used in conjunction with the overall engineering survey to provide continuity of reference points for this accident investigation.

The switch layout at Control Point 526.1 is equipped with M-23A Union Switch & Signal switch machine. It is a right hand turnout switch layout. The M -23A is capable of dual control function. It may be operated by hand or may be operated by the dispatcher from a remote location. Post-accident inspection of the switch located at CP 5261 revealed damage to the switch included a bent throw rod, detector rod, and lock rod. The reverse switch point was chipped and the normal switch point was rolled. Additionally, the M 23-A switch is equipped with point detection with a latch out device interconnected to the point detector rod which checks switch point closure separately from the lock rod connection. Point detection is used not only to check the switch point when it is first closed but also to detect damage to a switch point caused by dragging equipment or by traffic

running through the switch improperly while the machine is in the locked-up position. Inspection of the US&S M-23 switch machine revealed that the latch out device was effective and latched up which prevented the switch position indication contacts from closing. This damage along with the other switch damage is indicative of a switch that the reverse point was forcibly opened by a trailing point move.

The following figure 2-11 represents a M-23A switch machine latch out device latched up due to reverse point being forcibly opened while switch is in reverse position.

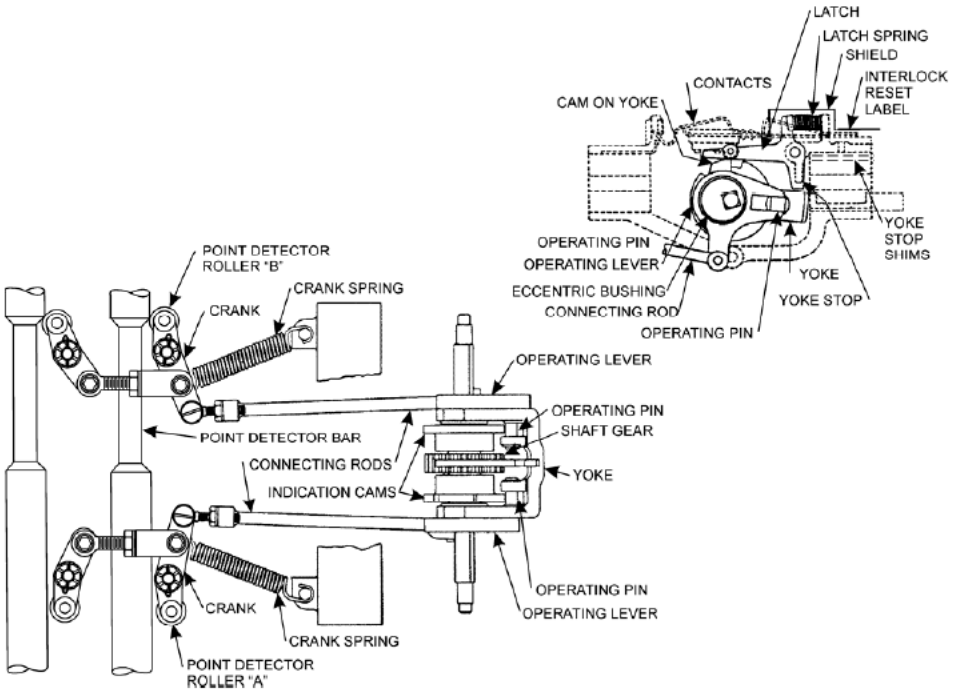
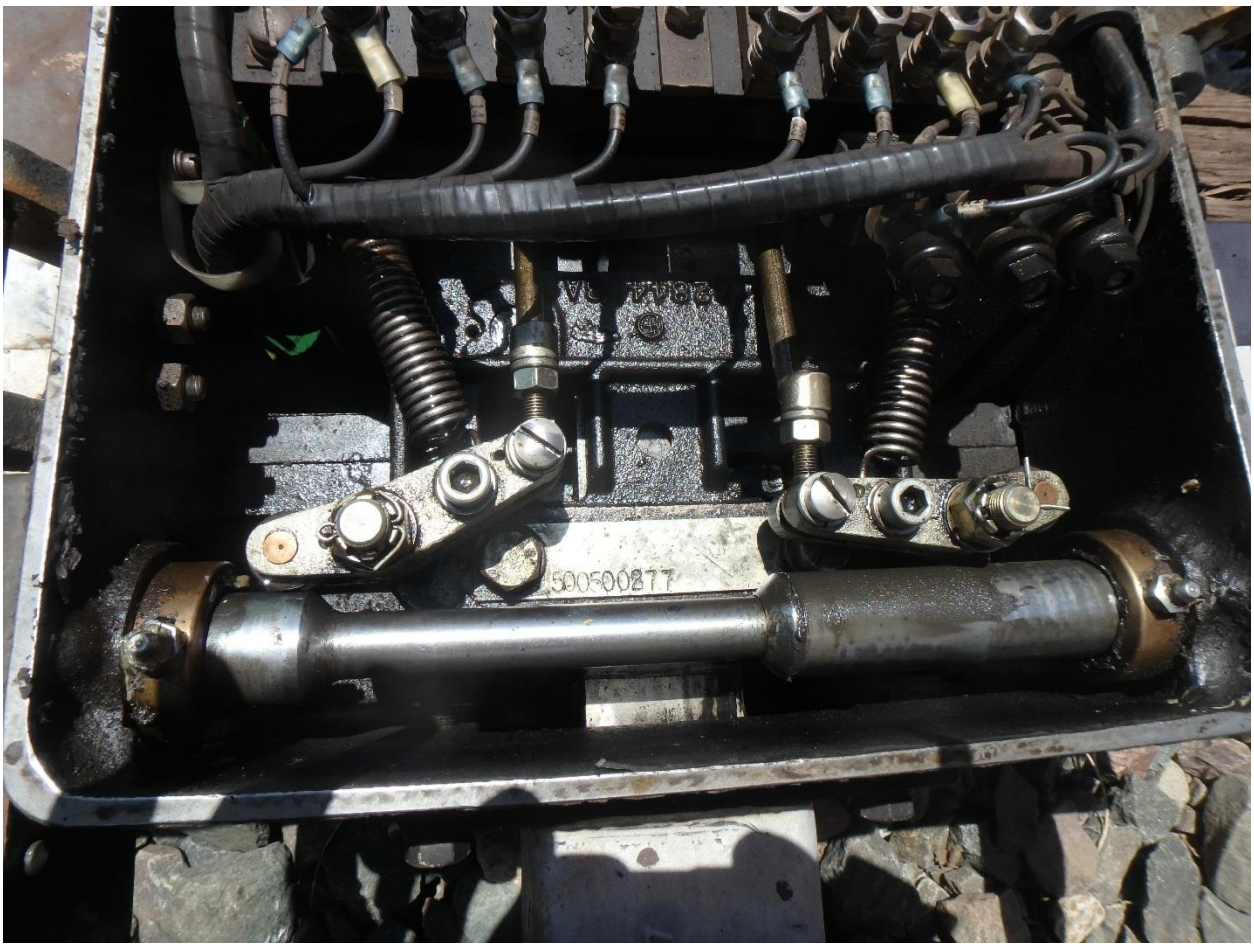


Figure 2–11 - Schematic Diagram of Point Detector – Parts in Reverse Position and Latched-Up

2.5 Gear Train

P-2 Schematic diagram of Point Detector- Parts in Reverse position and latched -up.

The following photograph is the point detector at CP 526.1 Panhandle TX after the collision.



Following the post-accident investigation, the switch rods and US&S M-23 switch machine were replaced. Although the US&S M-23 machine did not show visible damage, the machine was replaced as a precaution. During the derailment the intermediate signal located at MP 525.89 on Main Track 2 was also damaged.

There were no defects noted during the examination of the signal system or the associated signal appurtenances.

5. BNSF Signal System Trouble/Remedy Tickets

Signal system trouble/remedy tickets logged by the Network Operations Center for Signal 5332, CP 5314, CP 5289, CP 5261, Signal 5254, CP 5232 and Signal 5201 were provided by BNSF Railway. Records were reviewed with no exceptions taken.

6. BNSF Railroad Signal Maintenance Records

Railroad maintenance, inspection and tests records for signal locations including the intermediate signal 5332, CP 5314, CP 5289, CP 5261, intermediate signal 5254, CP 5232 and Signal 5201 were provided by BNSF Railway. Records were reviewed with no exception taken.

7. Damages

Total cost of signal damage including the signal and switch is estimated at $25,000

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Party to the Investigation - Acknowledgment Signatures

The undersigned designated *Party to the Investigation* representatives attest that the information contained in this report is a factually accurate representation of the information collected during the investigation, to the extent of their best knowledge and contribution in this investigation.

_____ Date 11-15-2016
Dan Pittman, BNSF Railway /s/

_____ Date 11-15-2016
Larry Brackett, BNSF /s/

_____ Date 11-15-2016
George Rasco, Federal Railroad Administration /s/

_____ Date 11-15-2016
Ricky Page, NTSB /s/

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