Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2005-56

Burlington Northern Santa Fe (BNSF)
Kingman, Arizona
July 30, 2005

Note that 49 U.S.C. §20903 provides that no part of an accident or incident report made by the Secretary of Transportation/Federal Railroad Administration under 49 U.S.C. §20902 may be used in a civil action for damages resulting from a matter mentioned in the report.

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File # HQ-2005-56

1.Name of Railroad Operating Train #1: BNSF Rwy Co. [BNSF]	1a. Alphabetic Code: BNSF	1b. Railroad Accident/Incident No.: SW0705122
2.Name of Railroad Operating Train #2: BNSF Rwy Co. [BNSF]	2a. Alphabetic Code: BNSF	2b. Railroad Accident/Incident: SW0705122
3.Name of Railroad Responsible for Track Maintenance: BNSF Rwy Co. [BNSF]	3a. Alphabetic Code: BNSF	3b. Railroad Accident/Incident No.: SW0705122
4. U.S. DOT_AAR Grade Crossing Identification Number	5. Date of Accident/Incident: Month 07 / Day 30 / Year 2005	6. Time of Accident/Incident: 12:10: ☑ AM ☐ PM

7. Type of Accident/Indicent (single entry in code box): 1. Derailment; 2. Head on collision; 3. Rear end collision; 4. Side collision; 5. Raking collision; 6. Broken Train collision; 7. Hwy-rail crossing; 8. RR grade crossing; 9. Obstruction; 10. Explosion-detonation; 11. Fire/violent rupture; 12. Other impacts; 13. Other (describe in narrative): 03

8. Cars Carrying HAZMAT	9. HAZMAT Cars Damaged/Derailed	10. Cars Releasing HAZMAT	11. People Evacuated	12. Division
3	0	0	0	Southwest

13. Nearest City/Town	14. Milepost (to nearest tenth)	15. State Abbr	15. State Code	16. County
Kingman	515.4	N/A	AZ	MOHAVE

17. Temperature (F) (specify if minus)	18. Visibility (single entry) 1. Dawn 2. Day 3.Dusk 4.Dark	Code	19. Weather (single entry) 1. Clear 2. Cloudy 3. Rain 4. Fog 5.Sleet 6.Snow	Code	20. Type of Track 1. Main 2. Yard 3. Siding 4. Industry	Code
75 F		4		1		1

21. Track Name/Number	22. FRA Track Class (1-9, X)	Code	23. Annual Track Density (gross tons in millions)	24. Time Table Direction 1. North 3. East	Code
Main 2		3	68.91		3

OPERATING TRAIN #1

25. Type of Equipment Consist (single entry) 1. Freight train 2. Passenger train 3. Commuter train 4. Work train 5. Single car 6. Cut of cars 7. Yard/switching 8. Light loco(s). 9. Maint./inspect.car	A. Spec. MoW Equip. Code	26. Was Equipment Attended? 1. Yes 2. No	Code	27. Train Number/Symbol
	1	1. Yes	1	ZLAC WSP42

28. Speed (recorded speed, if available) R - Recorded E - Estimated			Code
E - Estimated	18	MPH	R

30. Method(s) of Operation (enter code(s) that apply)

a. ATCS	g. Automatic block	m.Special instructions	
b. Auto train control	h. Current of traffic	n. Other than main track	
c. Auto train stop	i. Time table/train orders	o. Positive train control	
d. Cab	j.Track warrant control	p. Other	
e. Traffic	k. Direct traffic control		
f. Interlocking	l.Yard limits		

(Specify in narrative) Code(s): e | g | N/A | N/A | N/A

30a. Remotely Controlled Locomotive? 0 = Not a remotely controlled; 1 = Remote control portable; 2 = Remote control tower; 3 = Remote control transmitter - more than one remote control transmitter: 0

29. Trailing Tons (gross tonnage, excluding power units): 4672

31. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded (yes/no)
(1) First involved (derailed, struck, etc)	N/A	1	N/A
(2) Causing (if mechanical cause reported)	0	0	N/A

32. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box.

Alcohol	Drugs
0	0

33. Was this consist transporting passengers? (Y/N): N

34. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote
(1) Total in Train	4	0	0	0	0
(2) Total Derailed	2	0	0	0	0

35. Cars	Loade a. Freight	Loade b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	71	0	0	0	0
(2) Total Derailed	2	0	0	0	0

36. Equipment Damage This Consist	37. Track, Signal, Way, & Structure Damage	38. Primary Cause Code	39. Contributing Cause Code
645715	2000	H605	N/A

Number of Crew Members				Length of Time on Duty	
40. Engineer/ Operators	41. Firemen	42. Conductors	43. Brakemen	44. Engineer/Operator	45. Conductor
N/A	0	1	0	Hrs 2 Mi 10	Hrs 2 Mi 10

Casualties to:	46. Railroad Employees	47. Train Passengers	48. Other
Fatal	0	0	0
Nonfatal	N/A	0	0

49. EOT Device? 1. Yes 2. No: 1

50. Was EOT Device Properly Armed? 1. Yes 2. No: 1

51. Caboose Occupied by Crew? 1. Yes 2. No: N/A

OPERATING TRAIN #2

52. Type of Equipment Consist (single entry) 1. Freight train 2. Passenger train 3. Commuter train 4. Work train 5. Single car 6. Cut of cars 7. Yard/switching 8. Light loco(s). 9. Maint./inspect.car	A. Spec. MoW Equip. Code	53. Was Equipment Attended? 1. Yes 2. No	Code	54. Train Number/Symbol
	1	1. Yes	1	SOIGC H1326

55. Speed (recorded speed, if available) R - Recorded E - Estimated			Code
E - Estimated	0	MPH	R

57. Method(s) of Operation (enter code(s) that apply)

a. ATCS	g. Automatic block	m.Special instructions
b. Auto train control	h. Current of traffic	n. Other than main track

57a. Remotely Controlled Locomotive? 0 = Not a remotely controlled; 1 = Remote control portable

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56. Trailing Tons (gross tonnage, excluding power units)	c. Auto train stop d. Cab e. Traffic f. Interlocking	i. Time table/train orders j.Track warrant control k. Direct traffic control l.Yard limits	o. Positive train control p. Other (Specify in narrative) Code(s)	2 = Remote control tower 3 = Remote control transmitter - more than one remote control transmitter
6027			e g N/A N/A N/A	0

58. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded (yes/no)	59. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box.	Alcohol	Drugs
(1) First involved (derailed, struck, etc)	DTTX7 32912	42	yes		N/A	N/A
(2) Causing (if mechanical cause reported)	0	N/A	N/A	60. Was this consist transporting passengers? (Y/N)		N/A

61. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote
(1) Total in Train	6	0	0	0	0
(2) Total Derailed	0	0	0	0	0

62. Cars	Loade a. Freight	Loade b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	69	0	0	0	0
(2) Total Derailed	1	0	0	0	0

63. Equipment Damage This Consist	64. Track, Signal, Way, & Structure Damage	65. Primary Cause Code	66. Contributing Cause Code
159060	0	H605	N/A

Number of Crew Members				Length of Time on Duty	
67. Engineer/ Operators	68. Firemen	69. Conductors	70. Brakemen	71. Engineer/Operator	72. Conductor
1	N/A	1	N/A	Hrs 3 Mi 10	Hrs 3 Mi 10

Casualties to:	73. Railroad Employees	74. Train Passengers	75. Other
Fatal	0	0	0
Nonfatal	0	0	0

76. EOT Device? (1. Yes 2. No)	77. Was EOT Device Properly Armed? (1. Yes 2. No)	78. Caboose Occupied by Crew? (1. Yes 2. No)
1	1	N/A

Highway User Involved

79. Type	Code
A. Auto B. Truck C. Truck-Trailer. D. Pick-Up Truck E. Van F. Bus G. School Bus H. Motorcycle J. Other Motor Vehicle K. Pedestrian M. Other (spec. in narrative)	N/A

80. Vehicle Speed (est. MPH at impact)	81. Direction geographical) 1.North 2.South 3.East 4.West	Code
N/A		N/A

82. Position	Code
1.Stalled on Crossing 2.Stopped on Crossing 3.Moving Over Crossing 4. Trapped	N/A

86a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? (1. Highway User 2. Rail Equipment 3. Both 4. Neither)	Code
	N/A

Rail Equipment Involved

83. Equipment	Code
1.Train(units pulling) 2.Train(units pushing) 3.Train (standing) 4.Car(s) (moving) 5.Car(s) (standing) 6.Light Loco(s) (moving) 7.Light(s) (standing) 8.Other (specify in narrative)	N/A

84. Position of Car Unit in Train
N/A

85. Circumstance	Code
1. Rail Equipment Struck Highway User 2. Rail Equipment Struck by Highway User	N/A

86b. Was there a hazardous materials release by (1. Highway User 2. Rail Equipment 3. Both 4. Neither)	Code
	N/A

86c. State here the name and quantity of the hazardous materials released, if any.
N/A

87. Type of Crossing Warning (1.Gates 2.Cantilever FLS 3.Standard FLS 4.Wig Wags 5.Hwy. traffic signals 6.Audible 7.Crossbucks 8.Stop signs 9.Watchman 10.Flagged by crew 11.Other (spec. in narr.) 12.None)	88. Signaled Crossing Warning (See instructions for codes) Code	89. Whistle Ban (1. Yes 2. No 3. Unknown) Code
Code(s) N/A N/A N/A N/A N/A N/A N/A		N/A

90. Location of Warning (1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach)	Code	91. Crossing Warning Interconnected with Highway Signals (1. Yes 2. No 3. Unknown)	Code	92. Crossing Illuminated by Street Lights or Special Lights (1. Yes 2. No 3. Unknown)	Code
	N/A		N/A		N/A

93. Driver's Age	94. Driver's Gender (1. Male 2. Female)	Code	95. Driver Drove Behind or in Front of Train and Struck or was Struck by Second Train (1. Yes 2. No 3. Unknown)	Code	96. Driver (1. Drove around or thru the Gate 2. Stopped and then Proceeded 3. Did not Stop 4. Stopped on Crossing 5. Other (specify in narrative))	Code
0		N/A		N/A		N/A

97. Driver Passed Standing Highway Vehicle (1. Yes 2. No 3. Unknown)	Code	98. View of Track Obscured by (primary obstruction) (1. Permanent Structure 2. Standing Railroad Equipment 3. Passing Train 4. Topography 5. Vegetation 6. Highway Vehicle 7. Other (specify in narrative) 8. Not obstructed)	Code
	N/A		N/A

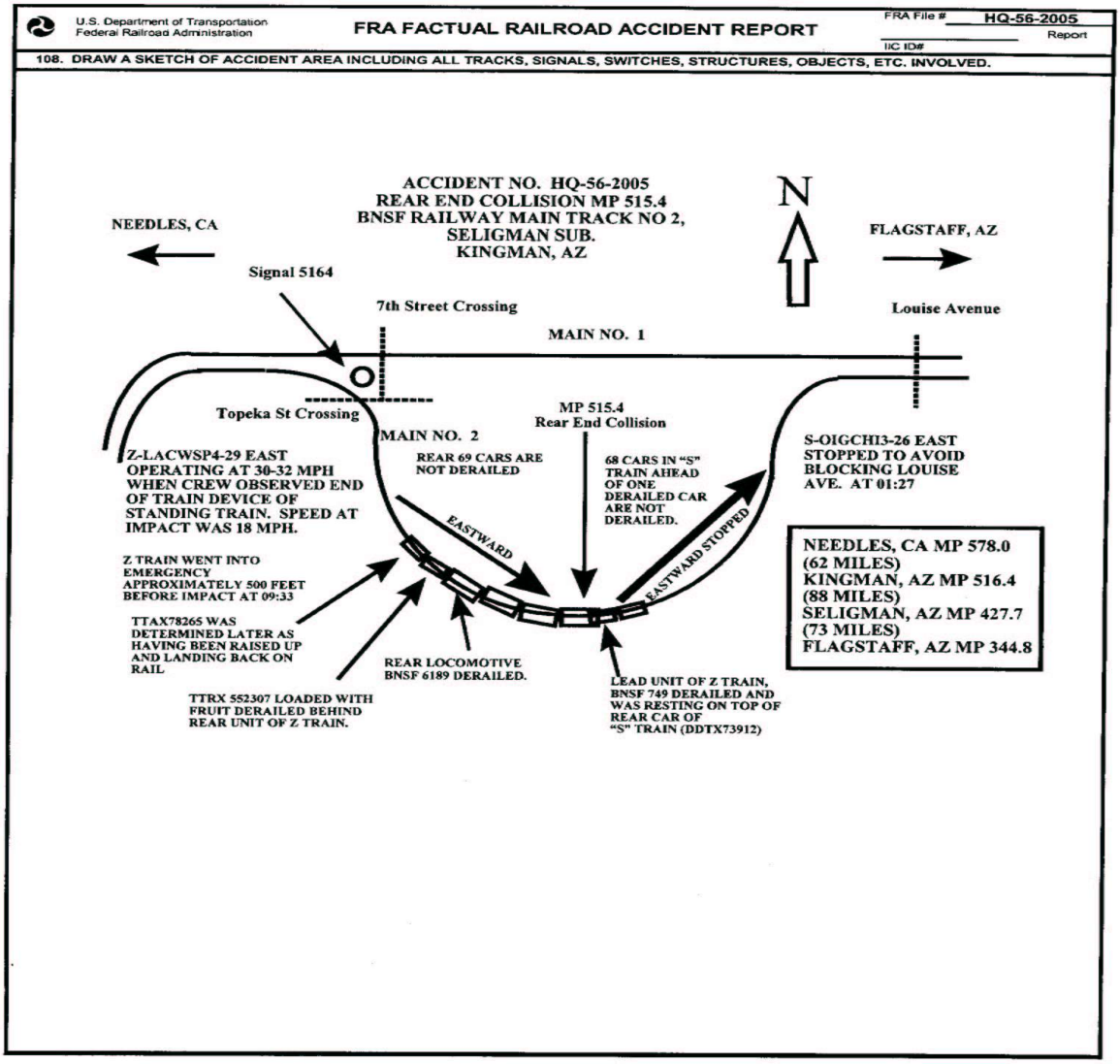
101. Casulties to Highway-Rail Crossing Users	Killed	Injured
	0	0

99. Driver Was (1. Killed 2.Injured 3. Uninjured)	Code	100. Was Driver in the Vehicle? (1. Yes 2. No)	Code
	N/A		N/A
102. Highway Vehicle Property Damage (est. dollar damage)	0	103. Total Number of Highway-Rail Crossing Users (include driver)	0

104. Locomotive Auxiliary Lights? (1. Yes 2. No)	Code	105. Locomotive Auxiliary Lights Operational? (1. Yes 2. No)	Code
	N/A		N/A
106. Locomotive Headlight Illuminated? (1. Yes 2. No)	Code	107. Locomotive Audible Warning Sounded? (1. Yes 2. No)	Code
	N/A		N/A

108. DRAW A SKETCH OF ACCIDENT AREA INCLUDING ALL TRACKS, SIGNALS, SWITCHES, STRUCTURES, OBJECTS, ETC., INVOLVED.

HQ-56-2005.jpg



109. SYNOPSIS OF THE ACCIDENT

For the purpose of this report, all times are expressed in Mountain Standard Time as Arizona does not revert to Daylight Savings Time as the other states do in the Mountain Time Zone.

On July 30, 2005, at 12:10 a.m. Mountain Standard Time (MST), eastbound BNSF freight train Z-LACWSP-4-29 (Train #1) collided with the rear end of a standing BNSF train S-OIGCHI-3-26 (Train #2) in Kingman, Arizona. Train #2 was also an eastbound train and had stopped behind another train doing work east of Kingman. There were no injuries and no release of hazardous materials.

The accident occurred on BNSF's Main Track No. 2 in Kingman at MP 515.4 on the Seligman Subdivision, Southwest Division. Approaching Kingman from the west, there is a long right-hand, compound curve with a maximum curvature of 4 degrees. Approximately 500 feet west of the signal at MP 516.3, Main Track No. 2 diverges from Main Track No. 1 and returns to a parallel configuration near MP 514.1. East of the signal, the track curves to the left at 3 degrees for approximately 1,000 feet before the point of collision. Main Track No. 2 ascends eastward at up to 1.4 percent. The railroad timetable and geographical directions of both trains is east. The maximum authorized speed for this subdivision is 70 mph, as designated in the current BNSF Timetable No. 2, effective October 20, 2004. However, the maximum operating speed at this location is 40 mph for passenger trains and 35 mph for freight trains.

The collision occurred on a long, lefthand curve on a high earthen fill. Visibility was temporarily obscured by the presence of an unused tool shed on the north side of Main Track No. 2. The accident did not affect Main Track No. 1.

Comparisons of the event recorders on the lead locomotives of both trains indicate that Train #2 was stopped for approximately eight minutes before being struck by Train #1. Analysis of the event recorder on the lead locomotive of Train #1 indicates that it was operating at approximately 30 mph approaching the accident area and then slowed to approximately 18 mph after an emergency application of the air brakes, traveling approximately 500 feet to the point of impact.

Derailed equipment consisted of two locomotives and two cars on Train #1 and one car on Train #2. The lead locomotive (BNSF 749) of Train #1 destroyed the rear articulated car (DDTX 73912) of Train #2. The rear locomotive (BNSF 6189) of Train #1 also derailed and the first articulated car (TTRX 552307) in the consist was destroyed. The second car (TTAX 78265) next to the locomotives on Train #1 was upright and on the rails, but a later mechanical inspection by the BNSF determined that the car was raised in the air by the impact. Damages to the two locomotives and two cars on Train #1 was $645,715 and damage to the rear car of Train #2 was $159,060. Track damage was minimal, estimated at $2,000.

The weather was clear at the time of the accident; temperature was 75 degrees Fahrenheit. However, crew members of both trains stated that it had been raining intermittently several minutes before the collision and there were numerous lightning strikes. A high wind warning had been issued previously for an area west of the derailment site but the wind was moderate at the time of the accident.

The probable cause of the accident is the crew of Train #1 failed to comply with restricted speed in connection with the restrictive indication of Signal 5164 G and operated at 30 mph instead of restricted speed as required. The train collided with the rear end of standing Train #2 on Main Track No. 2

110. NARRATIVE

Circumstances Prior to the Accident

Train #1

The crew of Train #1 went on duty at Needles, California, their home terminal, at 10:00 p.m. MST, July 29, 2005. The crew consisted of an engineer and conductor who both received more than the statutory off duty period prior to reporting for duty. The train departed Needles around 10:30 p.m. MST.

Train #1 consisted of four locomotives and 71 loaded cars, all articulated equipment with intermodal containers. It weighed 4,672 tons, was 6,881 feet long and was scheduled to travel to Chicago, Illinois.

Train #1 made no stops after leaving its home terminal and received clear signal indications enroute until it received a diverging approach (red over yellow) signal indication. It then went through the Griffith Siding around a train which was stopped on the main track. A diverging approach aspect requires the train to proceed on the diverging route, not exceeding the prescribed speed through the turnout. The crew said they received approach (yellow) indications as they neared Kingman. Approach indications require the train to be prepared to stop at the next signal. Trains exceeding 30 mph must immediately reduce to that speed. Train #1 operated at 30 mph as it proceeded east of the signal at MP 516.3 at the west end of Kingman.

As Train #1 approached Kingman, the engineer was seated on the right hand side of the locomotive at the engineer's controls and the conductor was in his seat on the left hand side of the locomotive. The event recorder on the lead locomotive indicated that the whistle was sounded at the Topeka Street Crossing adjacent to the signal at MP 516.3.

Train #2

The crew of Train #2 consisted of an engineer and conductor who went on duty at 9:00 p.m. MST, July 29, 2005, and departed Needles, California (MP 578.0), their home terminal, at 9:30 p.m. MST. Both crew members received more than the statutory off duty period prior to reporting for duty.

Train #2 consisted of six locomotives and 69 loaded cars. The cars were all articulated equipment with intermodal containers. It weighed 6,027 tons, was 6,587 feet long and was scheduled to travel to Kansas City, Missouri.

The crew received a high wind warning enroute which was lifted at about 10:10 p.m. MST. The train went through the Griffith Siding (MP 526.0) to go around a train. After leaving Griffith, the train received an approach medium indication (flashing yellow) approaching Kingman (MP 516.3). An approach medium indication requires the train to proceed prepared to pass the next signal not exceeding 40 mph and be prepared to enter the diverging route at the prescribed speed. The train later stopped west of the Louise Avenue road crossing in Kingman. After being stopped for about eight minutes, the engineer of Train #2 said his train unexpectedly went into emergency and shortly thereafter he heard conversation on the radio of a collision. The crew then realized that they had been struck from behind.

The Accident

Analysis of the event recorder from the lead locomotive Train #1 showed that the train was moving at 30 mph and had sounded the whistle at a crossing at MP 516.3 near the last signal before the collision. The point of collision was at MP 515.4 on Main Track No. 2 between intermediate signals 5164 G and 5134 G.

Both crew members of Train #1 said they passed the signal at MP 516.3 at 30 mph on an approach indication (yellow) and then proceeded around a left-hand curve.

An approach indication requires that the train be prepared to stop at the next signal and reduce to 30 mph if exceeding that speed. The crew said that they saw the flashing lights of an End of Train (EOT) Device and the engineer placed the train in emergency. The speed was reduced to 18 mph before impact with the rear car of Train #2.

BNSF conducted post accident toxicology testing of the crew of Train #1 following the accident.

Analysis and Conclusions

Analysis

Following the accident, the BNSF Signal Supervisor sealed the equipment at intermediate signals 5214 G, 5184 G, and 5164 G. FRA accompanied the BNSF when the equipment was unsealed and the event logs downloaded. Analysis shows the signal system functioned as intended.

FRA also accompanied BNSF managers during three re-enactment runs. One was accomplished after midnight on July 31, 2005. The signal system functioned as intended and Signal 5164 G displayed a red aspect. This aspect on Signal 5164 G requires the train to proceed at restricted speed. BNSF also conducted two additional runs after midnight on August 6, 2005. The purpose of the last two re-enactment runs was to determine if the street lights and crossing warning lights in Kingman affected the observation of Signal 5164 if it displayed restricting (red) and if the signal system functioned as intended. The re-enactments showed the signal system functioned as intended. The re-enactment team members on board the lead locomotives of the test trains observed Signal 5164 G approximately 3800 feet before the signal. Visibility of the signal was then blocked for one or two seconds by a small, unused tool shed west of the signal. Signal 5164 G was then observed at a point about 2500 feet west of the signal.

Conclusions:

Analyses of downloaded event logs indicate that the signal system functioned as intended and Train #1 would have received a restrictive aspect at Signal 5164 G because of the stopped train ahead. The restricting (red) signal was bright and could not be confused with any other lights in the area. However, the re-enactment team recommended the removal of an unused BNSF tool shed west of Signal 5164 to provide a full view for an eastward train at more than 3000 feet in advance of the signal. Based on that recommendation, BNSF removed the shed on August 19, 2005.

FRA Post-Accident Forensic Toxicology Result Reports indicates that the employees tested had negative test results.

Applicable Rules

The signal at MP 516.3 (5164 G) preceding the point of collision has a “G” number plate to indicate a grade marker. The System Special Instructions-General Signal Instructions Signal Rule 9.1.13 require the train to operate at restricted speed when displaying a restrictive aspect. Analysis of the signal system indicates it was functioning as intended and the train should have operated at restricted speed beyond the signal.

The General Code of Operating Rules (GCOR) 6.27 defines restricted speed as a speed not exceeding 20 mph which allows the train to stop short of a train, engine, railroad car, men or equipment fouling the track, stop signal, or derail or switch lined improperly.

Probable Cause & Contributing Factors

The crew of Train #1 failed to comply with restricted speed in connection with the restrictive indication of Signal 5164 G and operated at 30 mph rather than at the restricted speed as required. The train collided with the rear end of standing Train #2 on Main Track No. 2.