DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA

Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2006-88

Union Pacific
Midas, CA
November 9, 2006

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-2006-88

1.Name of Railroad Operating Train #1 Union Pacific RR Co. [UP]	1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. 1106RS011
2.Name of Railroad Operating Train #2 N/A	2a. Alphabetic Code N/A	2b. Railroad Accident/Incident N/A
3.Name of Railroad Responsible for Track Maintenance: Union Pacific RR Co. [UP]	3a. Alphabetic Code UP	3b. Railroad Accident/Incident No. 1106RS011
4. U.S. DOT_AAR Grade Crossing Identification Number	5. Date of Accident/Incident Month 11 Day 09 Year 2006	6. Time of Accident/Incident 11:02: ☑ 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)*

Code: 01

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

13. Nearest City/Town Colfax	14. Milepost *(to nearest tenth)* 162.4	15. State Abbr N/A Code CA	16. County PLACER

17. Temperature (F) *(specify if minus)*: 43 F

18. Visibility *(single entry)*: 1. Dawn 2. Day 3.Dusk 4.Dark — Code 2

19. Weather (single entry): 1. Clear 2. Cloudy 3. Rain 4. Fog 5.Sleet 6.Snow — Code 1

20. Type of Track: 1. Main 2. Yard 3. Siding 4. Industry — Code 1

21. Track Name/Number: Main Track 1

22. FRA Track Class (1-9, X): Code 2

23. Annual Track Density *(gross tons in millions)*: 8

24. Time Table Direction: 1. North 2. South 3. East 4. West — Code 4

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 4

26. Was Equipment Attended? 1. Yes 2. No — Code 1

27. Train Number/Symbol: WRECAP-09

28. Speed *(recorded speed, if available)* R - Recorded E - Estimated: 50 MPH — Code E

29. Trailing Tons *(gross tonnage, excluding power units)*: 1190

30. Method(s) of Operation *(enter code(s) that apply)*
a. ATCS
b. Auto train control
c. Auto train stop
d. Cab
e. Traffic
f. Interlocking
g. Automatic block
h. Current of traffic
i. Time table/train orders
j.Track warrant control
k. Direct traffic control
l.Yard limits
m.Special instructions
n. Other than main track
o. Positive train control
p. Other *(Specify in narrative)*

Code(s): j | N/A | 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

Code: 0

31. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded *(yes/no)*
(1) First involved *(derailed, struck, etc)*	N/A	3	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
N/A	N/A

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	1	0	0	1	0
(2) Total Derailed	0	0	0	0	0

35. Cars	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	9	2	0	0	0
(2) Total Derailed	9	1	0	0	0

36. Equipment Damage This Consist $1,400,000.00	37. Track, Signal, Way, & Structure Damage $541,000.00	38. Primary Cause Code H513	39. Contributing Cause Code E09L

Number of Crew Members

40. Engineer/ Operators	41. Firemen	42. Conductors	43. Brakemen
2	0	2	0

Length of Time on Duty

44. Engineer/Operator: Hrs 5 Mi 30

45. Conductor: Hrs 5 Mi 0

Casualties to:	46. Railroad Employees	47. Train Passengers	48. Other
Fatal	0	0	2
Nonfatal	N/A	0	0

49. EOT Device? 1. Yes 2. No — 2

50. Was EOT Device Properly Armed? 1. Yes 2. No — N/A

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 N/A

53. Was Equipment Attended? 1. Yes 2. No — Code N/A

54. Train Number/Symbol: N/A

55. Speed *(recorded speed, if available)* R - Recorded E - Estimated: 0 MPH — Code N/A

57. Method(s) of Operation *(enter code(s) that apply)*
a. ATCS
b. Auto train control
g. Automatic block
h. Current of traffic
m.Special instructions
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)* N/A

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): N/A | N/A | N/A | N/A | N/A

2 = Remote control tower
3 = Remote control transmitter - more than one remote control transmitter
N/A

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

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

Alcohol	Drugs
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	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0

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

63. Equipment Damage This Consist $0.00

64. Track, Signal, Way, & Structure Damage $0.00

65. Primary Cause Code N/A

66. Contributing Cause Code N/A

Number of Crew Members

67. Engineer/ Operators	68. Firemen	69. Conductors	70. Brakemen
0	0	0	0

Length of Time on Duty

71. Engineer/Operator Hrs 0 Mi 0

72. Conductor Hrs 0 Mi 0

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 N/A

77. Was EOT Device Properly Armed? 1. Yes 2. No N/A

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

Highway User Involved

79. Type
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)*
Code N/A

80. Vehicle Speed *(est. MPH at impact)* N/A

81. Direction *geographical)* 1.North 2.South 3.East 4.West Code N/A

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

84. Position of Car Unit in Train 0

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

Code(s): N/A | N/A | N/A | N/A | N/A | N/A | N/A

88. Signaled Crossing Warning *(See instructions for codes)* Code N/A

89. Whistle Ban 1. Yes 2. No 3. Unknown Code N/A

90. Location of Warning 1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach Code N/A

91. Crossing Warning Interconnected with Highway Signals 1. Yes 2. No 3. Unknown Code N/A

92. Crossing Illuminated by Street Lights or Special Lights 1. Yes 2. No 3. Unknown Code N/A

93. Driver's Age 0

94. Driver's Gender 1. Male 2. Female Code N/A

95. Driver Drove Behind or in Front of Train and Struck or was Struck by Second Train 1. Yes 2. No 3. Unknown Code N/A

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 N/A

97. Driver Passed Standing Highway Vehicle 1. Yes 2. No 3. Unknown Code N/A

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

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

99. Driver Was 1. Killed 2.Injured 3. Uninjured Code N/A

100. Was Driver in the Vehicle? 1. Yes 2. No Code 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 N/A

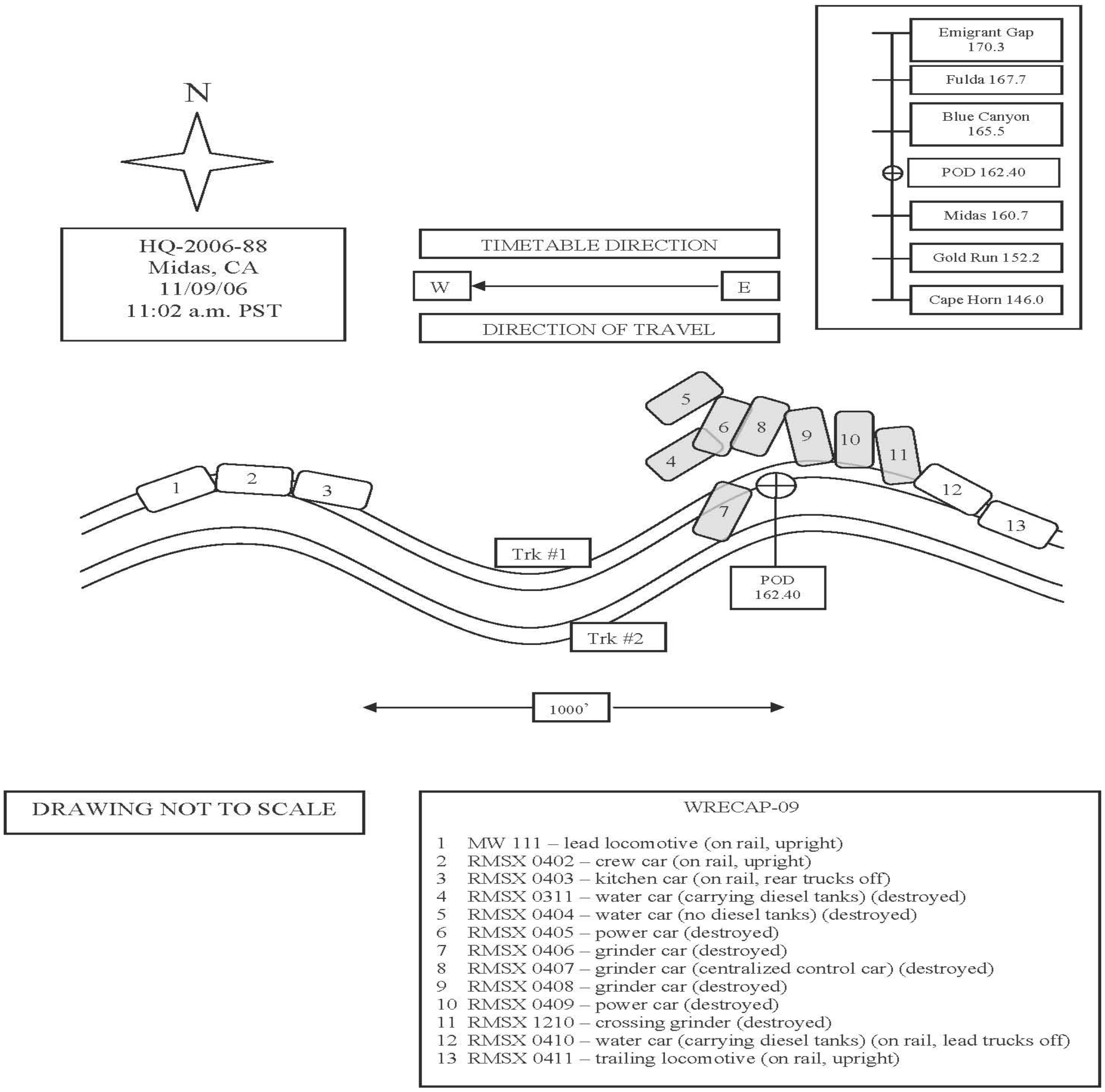
105. Locomotive Auxiliary Lights Operational? 1. Yes 2. No Code N/A

106. Locomotive Headlight Illuminated? 1. Yes 2. No Code N/A

107. Locomotive Audible Warning Sounded? 1. Yes 2. No Code N/A

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

SketchInWord.jpg



WRECAP-09

1 MW 111 – lead locomotive (on rail, upright)
2 RMSX 0402 – crew car (on rail, upright)
3 RMSX 0403 – kitchen car (on rail, rear trucks off)
4 RMSX 0311 – water car (carrying diesel tanks) (destroyed)
5 RMSX 0404 – water car (no diesel tanks) (destroyed)
6 RMSX 0405 – power car (destroyed)
7 RMSX 0406 – grinder car (destroyed)
8 RMSX 0407 – grinder car (centralized control car) (destroyed)
9 RMSX 0408 – grinder car (destroyed)
10 RMSX 0409 – power car (destroyed)
11 RMSX 1210 – crossing grinder (destroyed)
12 RMSX 0410 – water car (carrying diesel tanks) (on rail, lead trucks off)
13 RMSX 0411 – trailing locomotive (on rail, upright)

109. SYNOPSIS OF THE ACCIDENT

On November 9, 2006 at approximately 11:02 a.m. PST, Harsco Track Technologies (Harsco) rail grinding train WRECAP-09 being operated by a Harsco crew on Union Pacific Railroad (UP) trackage, derailed while in transit from Sparks, Nevada to Bakersfield, California.

The grinding train, identified as a work train by virtue of its train symbol “W”, was operating in a westward direction on a ruling 2.2% descending grade at mile post (MP) 162.4, near UP timetable station Midas, CA when the train initially derailed. Midas station is located at MP 161.4 near the town of Baxter, California, which is approximately 20 miles east of Colfax, California. The grinding train consisted of two locomotives and eleven cars and enlisted a crew of nine contract employees plus one UP Conductor Pilot. Ten of the 11 cars in the consist derailed and both locomotives remained upright and on the track. Two Harsco employees suffered fatal injuries in the derailment; all other crew members, including the UP employee, sustained either minor injuries or were uninjured.

The train was operating under track warrant authority within an Automatic Block Signal System (ABS). Track warrant authority was issued by the UP Dispatcher # 74 located in Omaha, Nebraska.

As a result of the derailment, volatile, compressed gases, diesel fuel and other petroleum products used in the rail grinding operation and carried in the train’s consist leaked from their containers, causing a fire to break out at the site of the general rail car pile-up. The fires were extinguished by local emergency fire fighters. There was no evacuation of the surrounding area ordered.

Weather at the time of the incident was daylight and clear with a temperature of 43 degrees F.

Damages were estimated at $1,400,000 equipment and $541,000 to track and signals.

The primary cause of the derailment is operation of a locomotive by uncertified/unqualified person(s), H513. The main contributing factor is other brake defects, E09L, as described in the report. There are additional contributing factors that are also described in the report and are summarized below:

a. Inexperience of the conductor pilot, the supervisor and engineer/operator over the territory they were operating on resulted in improper decision making when they required those skills and knowledge the most.

b. Lack of rules knowledge and operating experience made these employees unqualified to operate the train over the territory.

c. Lack of proper inspection and maintenance on the locomotives and cars prevented the train from slowing or stopping on the territory being traversed.

d. The conductor pilot assigned by the UP was not qualified to perform those duties over the territory to which he was assigned.

e. Neither the Harsco supervisor nor the engineer/operator were certified locomotive engineers and neither had been qualified over the territory to be traversed.

f. All safeguards that are normally in place would have prevented a similar train consist and crew in freight service from operating over the territory.

110. NARRATIVE

CIRCUMSTANCES PRIOR TO THE ACCIDENT

The railroad timetable and geographic direction are east to west and are used throughout this report.

The crew of the grinding train WRECAP-09 consisted of a UP conductor/pilot and nine crewmen. The nine Harsco employees, none of whom possessed a current engineer qualification certificate, were placed throughout the length of the train. The Harsco crew consisted of a supervisor and a train operator/engineer, stationed on the leading locomotive; an assistant supervisor in the kitchen car, two cars behind the leading locomotive; five grinding equipment operators, two each stationed in the crew and control cars and one on the rear locomotive; and a contract cook, also stationed in the kitchen car. The UP conductor pilot was also located in the lead locomotive.

The Harsco crew reported to the UP Sparks Yard in Sparks, Nevada at about 5:30 a.m. PST, November 9, 2006. The Harsco crew as a whole, and in particular, the train operator/engineer, is not subject to statutory hours of service requirements because they are considered maintenance of way machine operators. The UP conductor/pilot was called on duty at 6:00 a.m. PST at the UP Sparks yard office. This was the conductor/pilot's home terminal and he had received the required statutory off-duty period.

The train was scheduled to run from Sparks, Nevada to Bakersfield, California, a distance of approximately 424 miles, to begin a rail grinding project for the UP. The train was manned and designated to travel between the two points without making traditional crew change stops. Also, Harsco officials decided to take on all its fuel and water in Sparks rather than take the time at Roseville to complete that task. This significantly increased the weight of the train over the grade territory between Sparks and Roseville. The locomotive operators were scheduled to rest and change out with each other at designated intervals referred to as "a.m. and p.m." shifts. The UP conductor/pilot was assigned to travel between Sparks and Fresno, California.

The train consisted of two locomotives, one at each end of the train, and eleven cars. The total weight of the train, including locomotives was 1,320 tons with a total length of 680 feet. FRA estimated that if the train air brakes functioned as intended on all 11 cars in the train, the "tons per operative brake" (TPOB) would have been approximately 146.6. This train had no operative dynamic braking power, despite the requirement for dynamic braking in UP rules. The train was not given a Class I Brake Test (Initial Terminal Inspection) prior to departing Sparks as required for a train but was given a Class III continuity brake test as well as a general inspection of the equipment at Sparks. Compressors (one each) on the locomotives were connected to a common brake pipe that was set at 90 psi. Of the eleven cars in the train, two were passenger-type equipment; the passenger cars were equipped with D-22 passenger car brake control valves. The other nine cars were equipped with freight car brake control valves. The passenger car valves were positioned in direct release to mimic the freight car brake valves, so that all the brakes on the grinder train would apply and release in the same manner while using the same brake pipe pressure.

UP contracts its rail grinding requirements out to companies such as Harsco. Rail grinding trains are rail cars and locomotives, which have been modified to perform specialized functions. The functions can be varied but in general the equipment is configured in the total consist to be able to physically grind head rail and rail edges to conform to standardized and uniform specifications. Grinding trains have rail grinding cars, water cars for fire protection, diesel fuel cars, and support cars for men and equipment needed to complete the task of grinding rail in various parts of the national rail system. The locomotives used on the train were initially built to be used in train service but were modified to produce a specific work result, i.e., to provide locomotion and generated power to and for the purpose of rail grinding. The locomotives in this grinding train have the capability of independently being used as freight locomotives.

The freight cars in the grinding train require the same standards of equipment and function as found on any other rail car. When the train is not in a grinding/working mode it must travel to its next work site, which, oftentimes, could be many miles away, as was the case with this train. During those periods, it travels as any other freight train would except for a complete railroad company train operating crew. UP requires a railroad company "operating pilot" who is, in general, and at the time of this derailment, a conductor who serves to advise the grinding train's operator concerning rules, regulations, speeds, special instructions and subjects specifically applicable to the territory being traveled.

From railroad west to railroad east and in the direction of intended movement, coinciding with front to rear respectively, the grinding train consisted of two locomotives and eleven other railroad cars as follows:

1. Locomotive (type GP38) MW 111
2. Crew Car RMSX 0402
3. Kitchen Car RMSX 0403
4. Water Car (carrying diesel tanks) RMSX 0311
5. Water Car (no diesel tanks) RMSX 0404
6. Power Car RMSX 0405
7. Grinder Car RMSX 0406

8. Grinder Car RMSX 0407 (centralized control car)
9. Grinder Car RMSX 0408
10. Power Car RMSX 0409
11. Crossing Grinder RMSX 1210
12. Water Car (carrying diesel tanks) RMSX 0410
13. Locomotive (type GP40) RMSX 0411

The rail grinding train departed Sparks, Nevada at 7:45 a.m. PST and arrived at the top of the ascending grade at Norden, California, a distance of approximately 51 miles, without incident at 9:51 a.m. No automatic air braking had been required throughout the trip prior to that point.

The territory west of Truckee, California, consists of a 2.01 percent ascending grade for approximately 14 miles from Truckee to Norden, California. The territory to be traveled by the grinding train west of Norden to Rocklin consists of a descending grade of approximately 77 miles of 2.23% ruling. Through the territory and route to be traveled by the grinding train there are curves ranging from two degrees to over 10 degrees. The derailment occurred on the high-side of an 8 degree, 27 minute left hand reverse curve, which was followed by an 8 degree, 11 minute right hand curve and a 7 degree, 50 minute left hand curve.

Track authority over the entire route of the Roseville Subdivision is a combination of CTC, TWC-ABS, CTC 2MT, ABS #1/CTC #2, ABS #2/CTC #1. In the immediate area surrounding the derailment, i.e., MP 170.7, Emigrant Gap to MP 161.4, Midas, Main Track authorization is TWC-ABS, which is granted and controlled by a dispatcher in Omaha, Nebraska. The UP timetable in effect for the Roseville Subdivision, Roseville Area Timetable #4, dated December 18, 2005, has a posted track speed of predominately 25 MPH for freight trains between Norden and the derailment site. There are short sections between the areas traveled that have permanent speed restrictions of 20 MPH and 30 MPH.

Upon assuming duty, the UP conductor pilot asked for but was not furnished the usual pre-departure train paperwork. These documents would have provided him the necessary information concerning the train consist, tons per operative brake, horsepower per tons, loads, empties, length, hazardous materials and their placement in the train, etc. Both locomotives were equipped with event recorders, however, neither were operative and had not been serviced in approximately 10 years.

Unless otherwise specified as CAD (UP's Computer Assisted Dispatching system) recorded, speeds cited throughout the report are approximations based upon interviews of the conductor pilot and controlling operators.

THE ACCIDENT

The train began descending the grade at Norden, about 30 miles east of the derailment site at approximately 9:51 a.m. Immediately after passing Norden (MP 191.2), the train's engineer/operator began having speed control issues and was unable to slow the train using a 10 pounds (PSI) reduction of automatic train air brakes. He immediately went to a full service application (23 to 26 PSI) and was able to slow the train speed to an average of about 25 MPH until reaching a point just west of MP 178.2. The conductor pilot knew the engineer/operator was having issues controlling the speed of the train at East Norden, which required 20 MPH speed, but he stated later in interviews that he did not comment because he felt the engineer was getting the train under control at a speed of 25 MPH. The conductor/pilot was unaware, as were the Harsco supervisor and engineer/operator, of the requirements of Timetable # 4, Item SI-12 concerning TPOB and dynamic brake restrictions. They continued down the grade at an average speed of 25 MPH to a point that is best estimated to be about MP 176.91, at approximately 10:22 a.m. This estimate is based on interviews and a review of the CAD data.

Between the stations of Shed 10 to the east end Switch 9 to the west (MP 176.91 and 176.31), the railroad is single track CTC, and for a distance of about 0.6 miles, the grade is almost level, ranging from 0.0 percent to 0.35 percent. Although it cannot be specifically determined, it is believed this is the point at which the engineer/operator and the conductor/pilot agreed it would be the proper time and place to release the automatic air brakes in order to recharge the depleting air system.

As the train was approaching MP 176.91 the train speed slowed to about 15-18 MPH while it was holding a full service air brake application. At that point the train air brakes were released and the engineer/operator began to re-charge the train air brake system to the 90 PSI originally maintained prior to cresting the grade at East Norden. The system did recharge as the engineer/operator had hoped but the train began to increase its speed again due to the short distance of relatively level track before the grade began descending again at MP 176.30 to 1.9 percent, or an average of 2.2 ruling all the way to the derailment site. The engineer/operator again began an initiation of the automatic air brakes, which very shortly required a full service application in order to slow the train. The train did slow to a speed of about 25 MPH for a short period of time, about 3 miles or less, and then began to accelerate to 30 MPH and above. The train reached a speed of 40 MPH at MP 166.8, which is west of Switch 9 in double track, TWC, ABS territory beginning at MP 171.2, as determined by a voice activated defect detector at that location. Prior to reaching MP 166.8, at approximately 10:46 a.m., the engineer/operator made an independent brake application and requested the engineer/operator on the trailing locomotive to also make an independent brake application in what was to be a futile effort to slow the train.

Using UP's CAD data, speeds of the train from West Norden, MP 191.2, to West Shed 10, MP 178.2, were calculated at just below an average of 25 mph. Speeds of the train from West Shed 10 to West Switch 9 MP 171.2, were calculated at an average of 25 mph, which is plausible due to the reduction of speed to about 15-18 MPH in the area near Shed 10.

An interview with the conductor pilot revealed that he advised the engineer/ operator and the supervisor in the cab, at a point just east of Switch 9 that, " the speed of the train is too high and something is wrong, you should stop the train." At the same time or shortly thereafter, the conductor pilot advised the engineer/operator to put the train into emergency using the lead locomotive automatic air brake valve, with which the supervisor concurred. The conductor pilot indicated that the train began to slow for a very short period of time but then picked up speed again. At that point the engineer/operator allowed the supervisor of the train to sit in the control seat while he went back into the trailing cars in order to apply hand brakes and warn the rest of the crew of the possible impending derailment of their train. After he and the others applied hand brakes, they braced themselves for a derailment and the engineer/operator went back to the lead locomotive. During this period of time the supervisor, positioned in the lead locomotive at the operator's seat, also advised the crewmen via radio to apply hand brakes and brace themselves for a derailment.

Upon returning to the lead locomotive, the engineer/operator stated that he observed the supervisor attempting to reverse the traction motors in order to reverse direction of the locomotive wheels. The supervisor said he believed he had reversed the motors because the train felt like it had slowed about eight miles per hour.

The train was in emergency and traveled from approximately MP 171.5 to MP 162.7 at speeds of between 38 mph and 50 mph when it finally derailed at MP 162.4. The rail grinder train had entered an eight-degree, 27-minute left hand curve as the train derailed the rear truck on the second lead car (RMSX 0403 Kitchen Car). The derailed car, with the rear trucks toward the high side of the curve and moving toward the bank side (west), pulled the third head car off the rail in the same direction and the following cars derailed behind it in a general pile up. There was a separation of about 1,000 feet between the rear of the second lead car and the head end of the third lead car due to a broken coupler caused by extreme coupler forces. The lead locomotive and the first lead car as well as the trailing locomotive did not derail. The remaining ten cars did derail.

Directly after the derailment, the conductor pilot looked back and saw smoke coming from the derailed cars. He attempted to contact the dispatcher by radio but all power had been lost on the lead locomotive. He successfully reached the dispatcher with his personal cell phone and was able to request emergency assistance and inform him of the derailment, which had blocked both main tracks. The conductor pilot began walking west with a red flag to warn any approaching trains of the derailment when he saw emergency personnel begin to arrive at the scene. The emergency personnel included the Placer County Sheriff's Department, Placer County Coroner's Office, California Department of Forestry, American Medical Response ambulances and emergency medical technicians, and California Highway Patrol.

A fire started at the derailment site due to the flammable material in and on the train, i.e., oil, diesel fuel, propane and acetylene. The exact amount of diesel fuel spilled is not known but was estimated to have been hundreds of gallons. The spilled fuel came from the fourth car behind the lead locomotive, a rail tank car that was equipped with diesel fuel tanks mounted on top of the car. There was no evacuation ordered near the site, and fire department personnel allowed all of the cars to burn off the flammable materials. The fire was extinguished at approximately 4:30 p.m, after which a six-hour cool down period was required before entry could be gained for an inspection of the derailed rail cars.

Seven Harsco employees and the UP conductor/pilot were accounted for and had sustained either minor or no injuries. Shortly after the derailment it was known two Harsco employees were not accounted for. One of the missing Harsco employees was found deceased under the car by an employee of American Medical Response

Ambulance at approximately 11:30 a.m. The other was found deceased by the Placer County Sheriffs Department at approximately 9:30 p.m., and recovered at approximately 1:45 a.m. the following day. Both decedents were found in the vicinity of the grinder car RMSX 0407, which was the centralized control car. According to the coroner's report, the cause of death to the employee under the car was blunt force trauma. The cause of death to the other employee in the car was probable inhalation of combustible products, which secondarily lead to extensive post-mortem burns over the entire body.

The cost of the derailment was $1,400,000 to equipment; $466,000 track and structure; and $75,000 signal.

POST ACCIDENT INVESTIGATION AND ANALYSIS:

OPERATING PRACTICES - THE TRAIN:

The investigation sought to determine if Harsco's WRECAP-09 was a train or specialized maintenance of way equipment. This train was being used to transport goods, equipment and people a distance of about 400 miles for the ultimate purpose of working as specialized maintenance of way equipment at that destination. The equipment was being operated under the rules and authority of a train. The definition of a train is "one or more locomotives coupled with one or more freight cars, except during switching service." The definition of freight cars is a vehicle designed to carry freight, or railroad personnel, by rail and a vehicle designed for use in a work or wreck train or other non passenger train." These definitions are indicative of the intent and purpose of this grinding train and why it was being operated on the day of the derailment. Its use was for extended travel, not grinding nor preparing to grind. Therefore, the grinding train was subject to the provisions of the Locomotive Inspection Act, 49 USC 20701, and the Safety Appliance Act, 49 USC 20302, and was to be operated in accordance with 49 CFR Part 232 (Brake Safety System Standards For Freight and Other Non-Passenger Trains and Equipment, End of Train Devices) as a locomotive and train, as well as subject to and in compliance with 49 CFR Parts 229 (Railroad Locomotive Safety Standards), 231 (Railroad Safety Appliance Standards), and 240 (Qualification and Certification of Locomotive Engineers).

As with any train movement, the power unit must be equipped with a brake system that permits the operator to apply and release the brakes on the cars being hauled. Therefore, FRA requires the performance of appropriate brake inspections and tests be made when handling such equipment from one work site to another. During interviews, it was determined that the Harsco supervisor and engineer/operator advised FRA that a Class III continuity brake test was made on the grinder train at Sparks, Nevada, prior to the train's departure. No initial terminal air brake test (class 1) was made on the grinder train at Sparks. Although 49 CFR does not require it, the power brake portion of the statute (49 USC 20302) requires a locomotive be equipped with a power-driving wheel brake and appliances for operating the train-brake system. Also, because the rail grinding sets are subject to 49 USC 20302(a)(5), FRA expects the railroads and operators of this equipment to have an inspection regiment in place that will ensure that the crews operating the equipment are aware of whether the brakes are in compliance with the applicable statutory requirements." The power brake portion of the statute "requires 100% operative brakes on the rail grinding set as all of the units are equipped with power brakes, as they are on the associated train line" of the train.

This train did not have operative dynamic brakes and should have been restricted to a timetable speed of 20 MPH in accordance with UP Timetable (TT) # 4, Item SI-12. Further, because the train did not have dynamic braking together with having to use more than an 18 pound reduction to control the speed at 25 MPH, the train should not have continued past West Norden at MP 191.2. It should have stopped and complied with TT # 4 Item SI-12 which states in part, "A train that experiences dynamic brake failure, or if the use of full dynamic brakes and an 18 pound brake pipe reduction will not control the train at the allowable speed, the train must be STOPPED and sufficient hand brakes set to prevent movement. The train must not proceed until additional dynamic braking is obtained, tonnage is reduced, or retainers on all cars are placed in operative position. The train must not proceed except as instructed by the district Manager of Operating Practices."

Union Pacific's General Code of Operating Rules (GCOR) states a train or engine occupying the main track is required to have a track warrant (GCOR 6.0). The grinding train was required to have a track warrant prior to departing Sparks, Nevada. GCOR Rule 6.3 requires trains to have track authorization and rule 10.1 confers authority for a train to operate on signal indication within CTC limits as controlled and granted by a dispatcher. The grinding train was granted such authority by the dispatcher and positively activated the signal systems on the Main Track as required by a train.

OPERATING PRACTICES - THE CREW:

The Harsco supervisor located in the lead locomotive was interviewed following the derailment. It was noted that he had not held a locomotive engineer certification since approximately 2001 when he worked on the Canadian Pacific Railroad (CP). Upon interviewing the Harsco engineer/ operator of the lead locomotive, it was noted that he had not held a locomotive engineer certification since 1998 when he worked with the Canadian National Railroad (CN). The Harsco supervisor and engineer/ operator both had been certified locomotive engineers in the past and both had traversed grade territory while operating a grinder train on at least one occasion prior to this incident. It was not determined how often or under what circumstance the previous experience occurred. The interview of the UP conductor pilot revealed that although he was a recently certified engineer, qualified as of February 3, 2006 , he had never operated as an engineer or conductor over the heavy grade territory on the UP Roseville Subdivision to which he had been assigned this day.

The investigation revealed the grinding train was placed into an emergency brake application very near Switch 9 (MP 171.2) at Emigrant Gap. The conductor pilot, the supervisor, and the engineer/operator decided that at or near 40 MPH the train could no longer be controlled with any braking forces available to them and they needed to stop the train. The engineer/operator placed the train into emergency, left the control seat of the locomotive, and let the supervisor sit in the engineer/operator's control seat. At that point the supervisor got on the radio and advised the crew members on the train to begin to tie handbrakes on the equipment and to take action to protect themselves from a probable derailment. The engineer/operator left the cab and went back into the train to advise the crew to complete the same instructions given by the supervisor via radio.

When the engineer/operator returned to the lead locomotive cab he stated he observed the supervisor attempting to reverse the traction motors of the locomotive. He stated he knew that would slide or flatten the locomotive wheels but indicated he knew it would slow the train. The supervisor stated that he kept attempting to reverse the motors and thought he had accomplished his goal because the train began to slow about 8 MPH prior to derailing.

The train was in a "runaway" condition because the emergency braking forces (about 13 PSI extra pressure) did not add enough further significant pressure to reduce the increasing forces of speed. With brakes in an operable condition, the train should have stopped. A fully charged brake pipe pressure is 90 PSI. When a full service reduction of the brake pipe is made, the brake pipe pressure is reduced by 26 PSI but the brake cylinder (the component which places pressure upon the brake shoe and thus the wheel) pressure is increased from zero to 64 PSI (26 and 64 equaling 90 PSI total). That would put 64 PSI from the brake shoe to the wheel. By going into emergency, the brake pipe pressure would immediately go to zero PSI. When this occurs, the brake cylinder pressure rises to a maximum pressure of 77 PSI and the brake shoes apply to the wheel. The maximum amount of pressure was applied to both the brake shoes and the wheels and the grinder train still would not stop.

The investigation also revealed what the supervisor had attempted to do (reverse the traction motors) could not happen when that make and model of locomotive was in emergency. Any locomotive built after 1972 with a 26L brake valve can not be put into reverse mode without first recovering the locomotive PC valve, which effectively requires recovering the air. In this case, it did not and could not have occurred with the train brake valve found as it was at the time of the derailment; which was in the emergency position. Furthermore, a post-accident inspection of the locomotive wheels showed no evidence of the wheels having slid; since there were no flat spots on the wheels.

MECHANICAL AND AIR BRAKE SYSTEMS:

Initial assessments made by NTSB, FRA, and the CPUC of the breaking components on the two locomotives and rail cars at the derailment site revealed the piston travel at all locations on both A and B locomotive units was excessive and the brake shoes did not display indications of having been overheated. Further, inspection of braking components on the cars indicated some, but not all, wheels, brake shoes and brake beams displayed clear evidence of recent overheating. The ones that did not are indicative of little or no braking force.

Quantum Event Recorders were extracted from both locomotives on the rail grinder and they were sent to the NTSB lab in Washington, D.C. for further evaluation. On November 14, 2006, NTSB notified FRA that there was no data recorded on the event recorders. The records inside the devices indicated they had not been serviced since 1996.

The investigation revealed that the locomotives were inspected by an employee of Lambton Diesel Specialists, Inc. (LDS), a company that services and maintains private railway equipment. On November 12, 2006, FRA and NTSB interviewed the employee who conducted the 92-day periodic inspections on locomotives MW111 and RMSX0411. Present during the interview were representatives from the CPUC, UP, Harsco and RSI.

The LDS employee stated he first inspected the locomotives in Morgan, Utah, in September 2006. Harsco had requested that he inspect and evaluate the locomotives and provide a written report. He stated he conducts inspections and makes repairs pursuant to 49 CFR Part 229 and Transport Canada Regulations. During this particular inspection, he inspected wheels, evaluated the engine, repaired fuel dilution and fuel injectors and provided a written report to Harsco. He sugested that Harsco employees replace the brake shoes, adjust piston travel and make other minor repairs.

FRA requested and received maintenance records for the subject locomotives. A review of those records indicate LDS did make an assessment of the locomotive as stated. In addition, records were found to support the employee's statement that he provided a written report to Harsco.

The interview with the LDS employee further revealed that he and another employee conducted 92-day inspections on both locomotives at UP's yard in Carlin, Nevada, on October 16, 2006. This inspection was made at Harsco's request and he was again required to provide a written report. The Carlin yard does not have a locomotive pit and the employee stated that an underneath inspection was not made on either locomotive for that reason. Their inspections, which were also identified verbally to Harsco, disclosed the following:

a. Poor housekeeping on Harsco's part was observed and reported
b. Electronic bail off could not be tested; locomotives were not tested
c. Missing flywheel covers were observed and reported
d. Exhaust needed repair
e. "B" unit did not have speed recorder cables

He indicated the piston travel was not excessive. He reset the safety controls, conducted a leakage and ground relay test, and tested the brake gauges. Once he completed his inspections and at Harsco's request, he signed the FRA Form F6180.49A (blue card). He stated he did not reinspect the locomotives before signing the blue card to verify Harsco repaired the defects that he verbally reported to Harsco and subsequently identified in his written report.

The surviving equipment, i.e., both locomotives and three cars in the derailment, was transported to Union Pacific Roseville yard maintenance facility on November 11, 2006 for further inspection by NTSB, FRA, and CPUC. At Roseville, the UP, Harsco and Rail Sciences Inc. (RSI) assisted with inspections and tests of the transported equipment. The remaining cars involved in the derailment were either destroyed in the derailment or destroyed in the clean up of the derailment and could not be properly inspected for compliance or defects.

On November 12, 2006, investigators from FRA and NTSB began inspections and tests on the following equipment at the UP Roseville maintenance facility:

- MW 111 lead and controlling GP-38 locomotive		(line 1 of consist)
- RMSX 0402	crew car	(line 2 of consist)
- RMSX 0403	kitchen/office car	(line 3 of consist)
- RMSX 0410	tank car (water/fuel)	(line 12 of consist)
- RMSX 0411	F40PH-2 locomotive	(line 13 of consist)

The inspectors examined the equipment's overall condition and its braking capabilities in particular. Inspection, testing and evaluation of the equipment disclosed defective air brake control valves and insufficient braking forces on the equipment as described in detail as follows:

LEAD AND CONTROLLING LOCOMOTIVE - MW 111

The lead locomotive, MW 111, is a 2000 HP GP38, built in 1993 and is equipped with 26L brakes. The locomotive is owned and operated by Harsco. Air brakes last received attention on December 15, 2005, at Portola, California, pursuant to 49 CFR 229.27 and 229.29. FRA's review of Harsco maintenance records for locomotive MW 111 revealed an annotation made in July, 2005, that the 1104 air brake (49 CFR 229.29) maintenance was approximately two years overdue.

Piston travel measurements were recorded with the brake pipe charged to 90 PSI, a full independent brake application, and with the original brake shoes in place. Piston travel ranged from 8" to 8.125". The maximum pistol travel for this locomotive was 8". Federal requirements state that the piston will be adjusted to no more than 1.5" less than the maximum travel; therefore, piston travel should have been no more than 6.5". With the independent brake applied, the original brake shoes could be easily pulled away from the wheel using a three-foot pry bar. The fact that the original brake shoes could be pried away from the wheels is indicative that there is little brake shoe force at the wheel. The original brake shoe thickness measured following the derailment ranged from 0.5" to 1.25".

Brake shoe force tests are not performed using brake shoes found on the locomotive at the time of the test. Rather, the original brake shoes are removed and replaced with a load test cell of 1.5" to simulate brake shoe force as if there were 1.5" brake shoes on the locomotive. The original brake shoes were removed and replaced with 1.5" load cells. Piston travel measurements were then recorded between 6.375" and 8".

Brake shoe force tests, also referred to as Golden Shoe or load cell tests, were conducted on locomotive MW 111 by RSI. The testing was done first with a full independent brake application and then with an emergency application. The total brake shoe force applied with the independent brake application was 49,170 pounds. The total brake shoe force applied with the emergency brake application was 49,900 pounds. The brake shoe forces registered were insufficient as braking forces should have been approximately 90,000 lbs. By using the load test cells, the brake shoe forces that were recorded for locomotive MW 111 are significantly higher than they would have been with the original brake shoes in place.

When the locomotive was placed in emergency, the inspectors observed a rise in the brake cylinder pressure to 78-80 PSI, after which an audible “pop” was heard in the brake valves followed by a drop in pressure to approximately 70 PSI. The significance of the “pop” and its relationship to the drop in pressure could not be determined.

UP mechanical department personnel were unable to remove the brake pin from the slack adjuster to adjust the piston travel, a task normally done with a hammer. The brake pins were frozen and required the use of oxygen/acetylene to heat and remove, along with a hammer and a large pry bar. It took approximately 45 minutes to adjust the piston travel on one brake cylinder, which, under normal circumstances, would usually take only a few minutes. It was obvious the piston travel had not been adjusted for an extended period of time. This condition was also noted on the list of work required on MW 111 by LDS to Harsco on July 28, 2006.

Upon adjusting the brake rigging, the piston travel on the rear trucks was adjusted to 3" and the original brake shoes were replaced with 1.5" load test cells at the L3 and L4 locations. The braking forces were then measured under full independent and emergency applications. Even under this optimum condition, the brake shoe forces measured at the rear of the locomotive were approximated at 22,670 lbs. and 23,440 lbs., respectively, which are half the 45,000 lbs. required for the rear trucks.

TRAILING LOCOMOTIVE - RMSX 0411

RMSX 0411 is a 2000 HP F40PH-2, built in 1996 and is equipped with 26L brakes. The locomotive is owned and operated by Harsco. The air brakes last received attention on December 16, 2005, at Portola, California, pursuant to 49 CFR 229.27 and 229.29.

FRA’s review of Harsco maintenance records for locomotive RMSX 0411 revealed an annotation made in July, 2005, that the 1104 air brake (49 CFR 229.29) maintenance was approximately three years overdue.

RMSX 0411 could not be started. To operate the brake cylinders, a single car test (SCT) device was attached to provide the proper air pressure needed to conduct the brake shoe force test. The brake cylinders were charged to 70 psi to simulate a full independent brake application. Piston travel measurements ranged between 8.125" and 8.25" with the original brake shoes in place. Original brake shoe thickness ranged between 0.25" and 0.75". With the independent brake applied, the original brake shoes could easily be pulled away from the wheel using a three foot pry bar, indicating there is little brake shoe force at the wheel. The original brake shoes were then removed and replaced with 1½" load cells; piston travel measurements were then recorded and ranged from 4.125" to 7.375".

Load cell tests were conducted on locomotive RMSX 0411 by RSI. The testing was done first with a full independent brake application. The total brake shoe force applied with the independent brake application was 92,480 lbs. However, by using the load test cells, the brake shoe forces that were recorded for locomotive RMSX 0411 are significantly higher than they would have been with the original brake shoes in place.

CREW CAR - RMSX 0402

A single car test (SCT) was conducted on crew car RMSX 0402. The car did not pass the brake pipe leakage test because the B1 quick service valve was leaking. In an attempt to complete the test, the B1 quick service valve was plugged and the SCT testing resumed. However, the car then failed the system leakage test due to a leak at the emergency C26 control valve. Testing was terminated. Load cell tests could not be conducted on this car because the air brake reservoirs failed to charge. SCT testing confirmed the car’s air brake system did not function as intended.

KITCHEN/OFFICE CAR - RMSX 0403

The SCT conducted on kitchen/office car RMSX 0403 revealed the emergency valve was defective and did not operate as intended. In addition, the car failed the minimum application and quick service limiting valve test.

The brake rigging would not allow the load test cells to be fitted into the L1 and L4 positions. The average force values for L2, R1 and R2 were used to calculate the missing value for the L1 position. The average force values for L3, R3 and R4 were used to calculate the missing value for the L4 position.

The test disclosed a total braking force of 7,960 lbs with a full service reduction and a total braking force of 18,813 lbs with an emergency application. Harsco reported the vehicle light weight as 90,000 pounds. The net braking ratio for this car was determined to be 8.84%, which is within an acceptable range for cars of that type. The brake shoe force test simulated forces that would have been present if the subject car was equipped with 1.5" brake shoes.

TANK CAR (Water/Diesel) - RMSX 410

Tank car RMSX 0410 is equipped with ABDW brakes and Wabco-Pac brake cylinders and no slack adjusters. Nominal piston travel for a Class I air brake test, pursuant to 49 CFR 232.205 for this braking system, is 0.75" to 3". The brakes are considered ineffective when piston travel is in excess of 4 inches. Piston travel ranged between 2.75" and 3.125" and therefore was within specified limits.

The subject car successfully passed the SCT with the exception of the hand brake test. The hand brake chain was worn into two parts, rendering the hand brake inoperative.

The load cell test disclosed a total braking force of 22,570 lbs with a full service reduction and a total braking force of 28,090 lbs with an emergency application. Harsco reported the vehicle light weight as 250,000 pounds. The net braking ratio for this car was determined to be 9.02%, which is within an acceptable range for cars of this type. The brake shoe force test simulated forces that would have been present if the subject car were equipped with 1.5" brake shoes.

A comprehensive search of all other records of maintenance, inspections and tests performed on the destroyed cars in the consist produced few results and is yet another indicator of the overall lack of attention given to the mechanical aspects of the grinder train equipment. As with any other rolling stock, these specialized maintenance of way equipment cars were subject to normal car inspections, including the 5-year Single Car Test (SCT), but Harsco was unable to provide records of these tests and inspections.

ANALYSIS AND CONCLUSIONS:

MOTIVE POWER & EQUIPMENT:

ANALYSIS:

a. Time-mandated inspection and maintenance (92 day inspection, annual, etc.) on both locomotives were inadequate. No underneath inspections were conducted, nor were all required inspections and tests completed. Harsco maintenance records disclosed required time-mandated maintenance and inspections were not conducted in a timely manner. Inspections and tests conducted on the equipment that was not destroyed disclosed inadequate maintenance practices and inspections.

CONCLUSION:

Due to the lack of inspection and maintenance procedures, significant defects were allowed to go undetected.

ANALYSIS:

b. Brake force tests on both locomotives revealed insufficient braking forces. This was supported by the fact that the brake shoes could be pulled away from the wheels with a full independent brake application. All brake cylinders had excessive piston travel and were fully extended.

CONCLUSION:

These conditions are a direct result of not conducting proper inspections, tests, and maintenance of the equipment.

ANALYSIS:

c. The air brake system on the crew car, RMSX 0402, could not be charged. For this reason, the Golden Shoe test was not conducted. The car had a defective emergency brake valve and a defective B1 quick service valve and the SCT could not be completed.

CONCLUSION:

These conditions substantiate objective evidence that proper inspection and maintenance procedures were not conducted on a consistent basis.

ANALYSIS:

d. Testing (SCT) on RMSX 0403 disclosed a defective emergency valve. The valve failed a minimum application and a quick service limiting valve tests.

Conclusion:

These conditions substantiate objective evidence that proper inspection and maintenance procedures were not conducted on a consistent basis.

ANALYSIS:

e. RMSX 410 (tank car) car passed all SCT tests with the exception of the hand brake test. The hand brake chain was worn into two separate parts, rendering the hand brake inoperative.

CONCLUSION:

The finding is a clear indication of the lack of inspection and equipment maintenance.

ANALYSIS:

f. The train was only given a “set and release” test as well as a general inspection of the equipment at Sparks.

CONCLUSION:

A class I air brake test (initial terminal inspection) was not performed prior to departing Sparks as required for trains.

CONDUCTOR/PILOT - discusses the issues concerning the conductor/pilot assigned by the UP to the train:

ANALYSIS:

a. 49 CFR Section 240.231 requires that an engineer who has never been qualified on the physical characteristics over which he is going to operate a train or engine, shall have a pilot who is qualified and certified as a locomotive engineer over the territory in question.

b. The conductor pilot was trained as an engineer/conductor who was certified but without experience. Despite being certified, he lacked sufficient training to perform either as an engineer or a conductor for the duty to which he was assigned.

c. He had never operated a train or any piece of equipment as a conductor or engineer over the territory he was called to provide supervision over.

d. He did not, and was not able to, gather the normal paperwork required by rule (GCOR 1.3.1) for information on the train he was supposed to supervise. Without the proper information on the train or equipment he was to handle, a determination could not be made as to the weight, length, or tons per operative brake. These are vital in determining the speed and other restrictions he must be cognizant of.

e. Neither he nor his crew conducted a job briefing (UP Safety Instructions Rule 70.3) to discuss safe movement or rules required to be known and applied, such as rules governing grade and equipment, prior to any action being taken by any member of UP or Harsco.

f. He did not know or comply with UP Special Instructions effective 0001 Sunday, April, 6, 2003 page 23 Item #8 (Descending Grade Operations), which requires an emergency brake application when speed reaches a speed 5 mph over the authorized speed, which happened almost immediately when the train crested the summit at Norden.

g. He did not know or comply with UP Roseville Area Timetable #4 effective 0001 Sunday, December 18, 2005 page 19, SI-12, Tonnage Restrictions (TPOB/TPDB), which would have required the train to stop at Norden, or should never have left Sparks except as instructed by the district manager of operating practices.

CONCLUSION (SUMMARY):

The conductor pilot was a qualified engineer but had never operated as one and had never operated over the grade territory of the Roseville Subdivision in any capacity. Therefore, his inexperience to perform the task to which he was assigned directly contributed to the chaos that ensued after cresting the grade at Norden.

The Specialized Maintenance of Way Equipment as a Train

ANALYSIS:

The rail grinder train was operated as a train. It was required to move on the same authority as a train. It was required to operate on the same rules (speed, track restrictions, track warrants, air brake, signals, Special Instructions, GCOR and safety rules) as any other train. The rail grinder train (or the equipment on it) could not meet the requirements of being able to run west of East Norden (MP 1192.5) per Timetable # 4. The tonnage was too high per operative brake requirements (100 TPOB if all brakes were working, and about 145 TPOB as determined after inspection) and the train was not equipped with dynamic brakes, as required by UP Rule. By rule, the train was not authorized to operate without authority of a manager of operating practices. This information was never known or communicated to any member of the crew operating the grinding train.

In guidelines published May 1, 2007, entitled “Enforcement of Rail Grinders”, FRA has said, “The power unit and the location of the control stand in the rail grinding sets each constitute a locomotive under the statute, but not the regulations.” The guidelines go on to say, “after determining that a power unit or location of the control stand is unsafe to operate, FRA should cite only the statute, and not the regulation when recommending a violation.” If a locomotive or train, not considered one under regulation, becomes one under statute then it becomes necessary to inspect the locomotive(s) and train under the statute. Because the Locomotive Inspection Act (49 USC 20701) allows FRA to use regulatory provisions, including those contained in Part 229, to determine if a locomotive or tender and its parts and appurtenances are in proper condition and safe to operate, it is rational to conclude that if locomotives and freight cars are being operated as a train they are to be held to the same standards of inspection and repair.

CONCLUSION:

The grinding train was dispatched, operated, crewed, and in all other respects considered a train but had not been subjected to the same governing rules, requirements, regulations, inspections, and crew qualifications as other trains operating over the territory.

HARSCO SUPERVISOR AND ENGINEER/OPERATOR:

ANALYSIS:

The supervisor and engineer/operator were trained to operate the Harsco grinding train; however, they were not sufficiently trained to operate it under the conditions and circumstances they found themselves in on the day of the derailment. The engineer/operator, as required by Harsco and UP, did not have a sufficient job briefing with the conductor pilot as it may have applied to the safe operation of the train/equipment in his charge. He did not advise, nor was he asked, about any tests of the equipment prior to departure. He did not advise, nor was he asked, concerning his knowledge of the territory about to be traveled. The engineer/operator was not a certified locomotive engineer and had not been for approximately seven years, i.e., since 1998 when he held an engineer’s certification with the CN railroad.

The supervisor, who was not a certified engineer but had been over the territory three times in the past six years, should have been somewhat familiar with heavy grade territory, i.e., any grade over 1.5%. He remained on the lead locomotive for a short period of time after the train began its descent westward from Norden summit. He said he stayed on the lead locomotive long enough to know the engineer/operator had it under control and then he went back into the train for other duties. Neither the equipment nor the train was under control because the operator could not control the speed less than 25 MPH with less than a full service reduction, or with any other available braking forces short of an emergency application.

Once the train crested the grade at Norden, the engineer/operator never had the train under control nor could he have due to lack of braking forces in the train. The operator said at least twice to the supervisor that there was something wrong with his train because he could not control the speed as he should have been able to. No one took control of the situation due to lack of experience and knowledge of the rules. No one ever asked what the Roseville Time Table said about tons per operative brake (TPOB), dynamic braking, or requirement to stop if train speed exceeded 5 MPH over authorized speed. No one actually understood what the authorized speed was because the conductor pilot was “OK” with 25 MPH in a 20 MPH zone and the engineer/operator thought the conductor pilot would advise him of how he should operate and control his train.

Controlling a train on an extended downhill grade cannot be done with a full service air brake application for extended periods of time. As with any train or rolling stock equipment, i.e., locomotives and freight cars, functioning brake shoes would heat to a point of either burning or melting and therefore would not deliver the required force to continue speed control. In this case, relatively few of the brake shoes on the locomotives and cars showed the effects of burning or overheating, indicating they were not working as intended. This was proven in subsequent testing. Also, none of the crew, niether Harsco or the UP conductor/pilot, had ever used and did not consider the use of retainers as may have been required. Retainer valves are a manually operated valve on cars to exhaust brake cylinder pressure completely or to maintain a predetermined pressure. In this case they may have been used to maintain a predetermined pressure allowing proper speed control if the air brake system was in proper and operable condition (UP Air Brake and Train Handling Rules 33.7.7). The rule explains when and how to use retainers.

CONCLUSION:

Neither the Harsco crew members nor the UP conductor pilot were trained in proper air brake/train handling over the territory assigned or in the proper use of retainers

ANALYSIS:

FRA signal personnel gathered data from equipment detectors and CAD reports to assist in the investigation.

CONCLUSION:

A review of all records, tests and inspections of the signal system indicated it functioned as intended and did not contribute to the derailment.

ANALYSIS:

FRA reviewed all records, test and inspections of track in the area of the derailment.

CONCLUSION:

The review excluded track as a contributing cause of the derailment.

ANALYSIS:

Although the equipment on this train is normally considered “specialized maintenance of way” equipment when at a work site and under the direction and management of UP’s Maintenance of Way (MofW) department, the grinding train in this case was being operated as a train and, therefore, under the direction and management of UP’s operating department. Yet, no oversight was given the train by UP’s operating department and no significant efficiency testing had taken place from UP towards the grinding train or its employees. No UP MofW or operating department supervisor was riding the train on the day of the derailment due to it being in a transit mode, rather than a working mode.

CONCLUSION:

UP has now issued instructions that would require a territorially qualified engineer to pilot the grinder train in grade territory.

PROBABLE CAUSE AND CONTRIBUTING FACTORS:

There are additional contributing factors that are described in the report and are summarized below:

a. Inexperience of the conductor pilot, the supervisor and engineer/operator over the territory they were operating on resulted in improper decision making when they required those skills and knowledge the most.

b. Lack of rules knowledge and operating experience made these employees unqualified to operate the train over the territory.

c. Lack of proper inspection and maintenance on the locomotives and cars prevented the train from slowing or stopping on the territory being traversed.

d. The conductor pilot assigned by the UP was not qualified to perform those duties over the territory to which he was assigned.

e. Neither the Harsco supervisor nor the engineer/operator were certified locomotive engineers and neither had been qualified over the territory to be traversed.

f. All safeguards that are normally in place would have prevented a similar train consist and crew in freight service from operating over the territory.

The main contributing factor is other brake defects, E09L, as described in the report.

The primary cause of the derailment, as determined by the Federal Railroad Administration was the operation of a locomotive by uncertified/unqualified person(s), H513.

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