
# *Federal Railroad Administration*
# *Office of Safety*
# *Headquarters Assigned*
# *Accident Investigation Report*
# *HQ-2007-29*

## *Union Pacific (UP)*
## *Nisqually, Washington*
## *May 16, 2007*

***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-2007-29

| | | |
|---|---|---|
| 1.Name of Railroad Operating Train #1: Union Pacific RR Co. [UP ] | 1a. Alphabetic Code: UP | 1b. Railroad Accident/Incident No.: 0507PD017 |
| 2.Name of Railroad Operating Train #2: Union Pacific RR Co. [UP ] | 2a. Alphabetic Code: UP | 2b. Railroad Accident/Incident No.: 0507PD017 |
| 3.Name of Railroad Operating Train #3: N/A | 3a. Alphabetic Code: N/A | 3b. Railroad Accident/Incident No.: N/A |
| 4.Name of Railroad Responsible for Track Maintenance: BNSF Rwy Co. [BNSF] | 4a. Alphabetic Code: BNSF | 4b. Railroad Accident/Incident No.: NW0507105 |
| 5. U.S. DOT_AAR Grade Crossing Identification Number: | 6. Date of Accident/Incident: Month 05 \| Day 16 \| Year 2007 | 7. Time of Accident/Incident: 03:08: ☑ AM ☐ PM |

8. 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: 05

| 9. Cars Carrying HAZMAT | 10. HAZMAT Cars Damaged/Derailed | 11. Cars Releasing HAZMAT | 12. People Evacuated | 13. Division |
|---|---|---|---|---|
| 6 | 2 | 0 | 0 | Northwest |

| 14. Nearest City/Town | 15. Milepost (to nearest tenth) | 16. State Abbr | 16. State Code | 17. County |
|---|---|---|---|---|
| Du Pont | 24.5 | N/A | WA | PIERCE |

| 18. Temperature (F) (specify if minus) | 19. Visibility (single entry) 1. Dawn 2. Day 3.Dusk 4.Dark — Code | 20. Weather (single entry) 1. Clear 2. Cloudy 3. Rain 4. Fog 5.Sleet 6.Snow — Code | 21. Type of Track 1. Main 2. Yard 3. Siding 4. Industry — Code |
|---|---|---|---|
| 45 F | 4 | 1 | 1 |

| 22. Track Name/Number | 23. FRA Track Class (1-9, X) — Code | 24. Annual Track Density (gross tons in millions) | 25. Time Table Direction 1. North 2. South 3. East 4. — Code |
|---|---|---|---|
| Main Track One | 4 | 42.34 | 2 |

## OPERATING TRAIN #1

| 26. 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 | 27. Was Equipment Attended? 1. Yes 2. No — Code | 28. Train Number/Symbol |
|---|---|---|
| 1 | 1 | ISEG3-15 |

| 29. Speed (recorded speed, if available) R - Recorded E - Estimated — Code | 31. Method(s) of Operation (enter code(s) that apply) | 31a. Remotely Controlled Locomotive? |
|---|---|---|
| 27 MPH R | 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): e N/A N/A N/A N/A | 0 = Not a remotely controlled; 1 = Remote control portable; 2 = Remote control tower; 3 = Remote control transmitter - more than one remote control transmitter: 0 |

30. Trailing Tons (gross tonnage, excluding power units): 6324

| 32. Principal Car/Unit | a. Initial and Number | b. Position in Train | c. Loaded (yes/no) |
|---|---|---|---|
| (1) First involved (derailed, struck, etc) | UP5261 | 1 | N/A |
| (2) Causing (if mechanical cause reported) | 0 | 0 | N/A |

33. 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 |

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

| 35. Locomotive Units | a. Head End | Mid Train b. Manual | Mid Train c. Remote | Rear End d. Manual | Rear End c. Remote | 36. Cars | Loaded a. Freight | Loaded b. Pass. | Empty c. Freight | Empty d. Pass. | e. Caboose |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Total in Train | 4 | 0 | 0 | 0 | 0 | (1) Total in Equipment Consist | 111 | 0 | 0 | 0 | 0 |
| (2) Total Derailed | 4 | 0 | 0 | 0 | 0 | (2) Total Derailed | 2 | 0 | 0 | 0 | 0 |

| 37. Equipment Damage This Consist | 38. Track, Signal, Way, & Structure Damage | 39. Primary Cause Code | 40. Contributing Cause Code |
|---|---|---|---|
| 0 | 0 | H221 | H605 |

Number of Crew Members

| 41. Engineer/ Operators | 42. Firemen | 43. Conductors | 44. Brakemen |
|---|---|---|---|
| 1 | 0 | 1 | 1 |

Length of Time on Duty

| 45. Engineer/Operator | 46. Conductor |
|---|---|
| Hrs 5 Mi 38 | Hrs 5 Mi 38 |

| Casualties to: | 47. Railroad Employees | 48. Train Passengers | 49. Other |
|---|---|---|---|
| Fatal | 0 | 0 | 0 |
| Nonfatal | 0 | 0 | 0 |

50. EOT Device? 1. Yes 2. No: N/A

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

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

## OPERATING TRAIN #2

| 53. 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 | 54. Was Equipment Attended? 1. Yes 2. No — Code | 55. Train Number/Symbol |
|---|---|---|
| 1 | 1 | IBASE-15 |

| 56. Speed (recorded speed, if available) R - Recorded E - Estimated — Code | 58. Method(s) of Operation (enter code(s) that apply) | 58a. Remotely Controlled Locomotive? |
|---|---|---|
| 24 MPH R | a. ATCS; b. Auto train control; g. Automatic block; h. Current of traffic; m.Special instructions; n. Other than main track | 0 = Not a remotely controlled; 1 = Remote control portable |

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57. Trailing Tons (gross tonnage, excluding power units): 6936

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

2 = Remote control tower
3 = Remote control transmitter - more than one remote control transmitter: 0

| 59. Principal Car/Unit | a. Initial and Number | b. Position in Train | c. Loaded (yes/no) |
|---|---|---|---|
| (1) First involved (derailed, struck, etc) | NWCA 1017 | 80 | yes |
| (2) Causing (if mechanical cause reported) | 0 | 0 | N/A |

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

| Alcohol | Drugs |
|---|---|
| 0 | 0 |

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

| 62. Locomotive Units | a. Head End | Mid Train b. Manual | Mid Train c. Remote | Rear End d. Manual | Rear End c. Remote | 63. Cars | Loaded a. Freight | Loaded b. Pass. | Empty c. Freight | Empty d. Pass. | e. Caboose |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Total in Train | 2 | 0 | 0 | 0 | 0 | (1) Total in Equipment Consist | 98 | 0 | 0 | 0 | 0 |
| (2) Total Derailed | 0 | 0 | 0 | 0 | 0 | (2) Total Derailed | 2 | 0 | 0 | 0 | 0 |

64. Equipment Damage This Consist: 141779

65. Track, Signal, Way, & Structure Damage: 0

66. Primary Cause Code: H221

67. Contributing Cause Code: H605

Number of Crew Members

| 68. Engineer/ Operators | 69. Firemen | 70. Conductors | 71. Brakemen |
|---|---|---|---|
| 1 | 0 | 1 | 0 |

Length of Time on Duty

72. Engineer/Operator: Hrs 7 Mi 8

73. Conductor: Hrs 7 Mi 8

| Casualties to: | 74. Railroad Employees | 75. Train Passengers | 76. Other |
|---|---|---|---|
| Fatal | 0 | 0 | 0 |
| Nonfatal | 0 | 0 | 0 |

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

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

79. Caboose Occupied by Crew? 1. Yes 2. No: 2

## OPERATING TRAIN #3

80. 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

81. Was Equipment Attended? 1. Yes 2. No Code: N/A

82. Train Number/Symbol: N/A

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

84. Trailing Tons (gross tonnage, excluding power units): 0

85. 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): N/A | N/A | N/A | N/A | N/A

85a. 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: N/A

| 86. 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 |

87. 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 |

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

| 89. Locomotive Units | a. Head End | Mid Train b. Manual | Mid Train c. Remote | Rear End d. Manual | Rear End c. Remote | 90. Cars | Loaded a. Freight | Loaded b. Pass. | Empty c. Freight | Empty d. Pass. | e. Caboose |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Total in Train | 0 | 0 | 0 | 0 | 0 | (1) Total in Equipment Consist | 0 | 0 | 0 | 0 | 0 |
| (2) Total Derailed | 0 | 0 | 0 | 0 | 0 | (2) Total Derailed | 0 | 0 | 0 | 0 | 0 |

91. Equipment Damage This Consist: 0

92. Track, Signal, Way, & Structure Damage: 0

93. Primary Cause Code: N/A

94. Contributing Cause Code: N/A

Number of Crew Members

| 95. Engineer/ Operators | 96. Firemen | 97. Conductors | 98. Brakemen |
|---|---|---|---|
| 0 | 0 | 0 | 0 |

Length of Time on Duty

99. Engineer/Operator: Hrs 0 Mi 0

100. Conductor: Hrs 0 Mi 0

| Casualties to: | 101. Railroad Employees | 102. Train | 103. Other |
|---|---|---|---|
| Fatal | 0 | 0 | 0 |
| Nonfatal | 0 | 0 | 0 |

104. EOT 1. Yes 2. No: N/A

105. Was EOT Device Properly 1. Yes 2. No: N/A

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

## Highway User Involved

107. 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

108. Vehicle Speed (est. MPH at impact): N/A

109. geographical) 1.North 2.South 3.East 4.West Code: N/A

## Rail Equipment Involved

111. 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

112. Position of Car Unit in: N/A

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| 110. Position | Code | 113. Circumstance | Code |
|---|---|---|---|
| 1.Stalled on Crossing 2.Stopped on Crossing 3.Moving Over Crossing 4. Trapped | N/A | 1. Rail Equipment Struck Highway User 2. Rail Equipment Struck by Highway User | N/A |
| 114a. 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 | N/A | 114b. Was there a hazardous materials release 1. Highway User 2. Rail Equipment 3. Both 4. Neither | N/A |

114c. State here the name and quantity of the hazardous materials released, if any.
N/A

| 115. Type 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 | | | | | |

| 116. Signaled Crossing (See instructions for codes) | Code | 117. Whistle 1. Yes 2. No 3. Unknown | Code |
|---|---|---|---|
| | N/A | | N/A |

| 118. Location of Warning 1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach | Code | 119. Crossing Warning with Highway Signals 1. Yes 2. No 3. Unknown | Code | 120. Crossing Illuminated by Street Lights or Special Lights 1. Yes 2. No 3. Unknown | Code |
|---|---|---|---|---|---|
| | N/A | | N/A | | N/A |

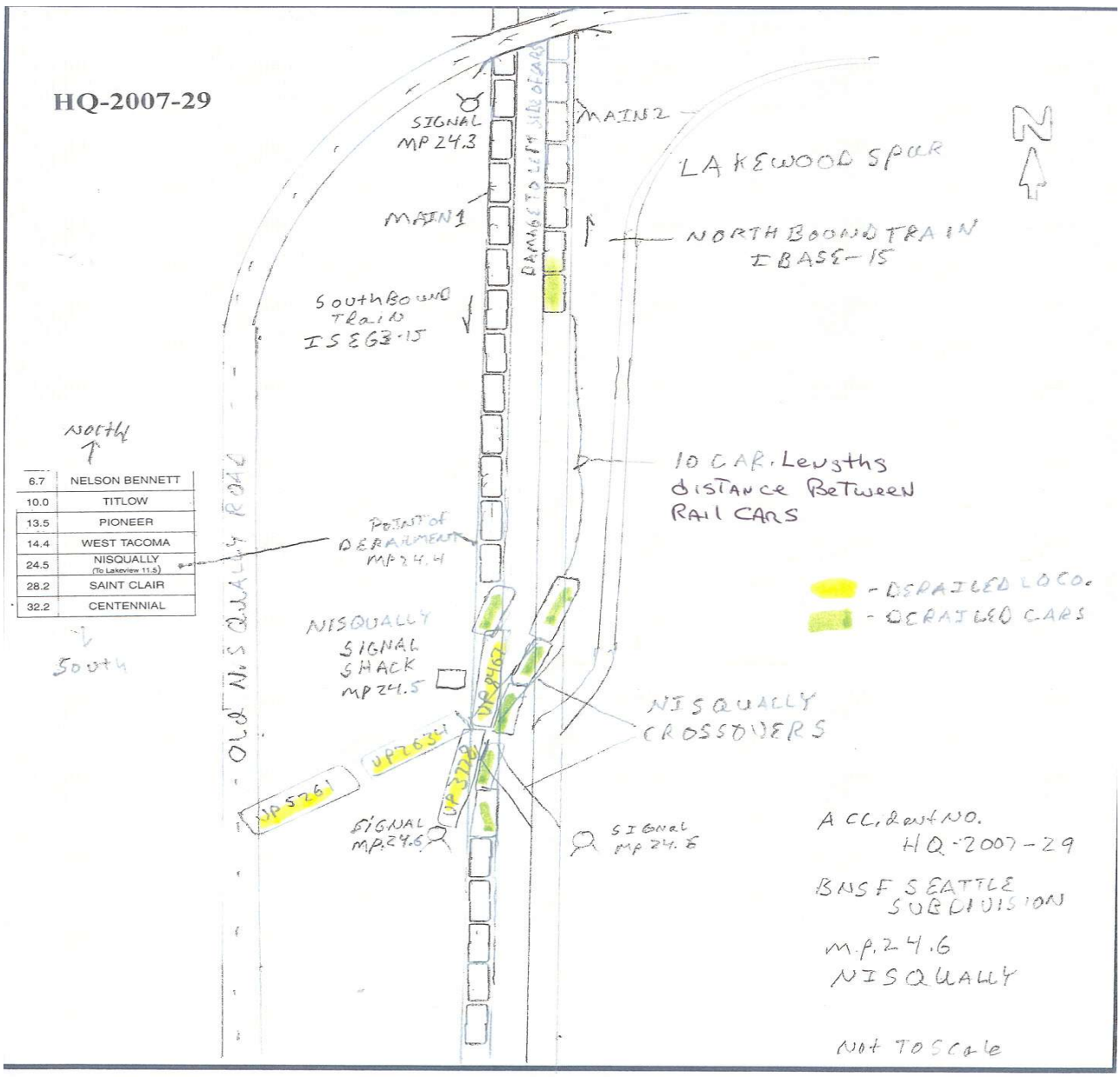
| 121. Age | 122. Driver's Gender 1. Male 2. Female | Code | 123. Driver Drove Behind or in Front of and Struck or was Struck by Second Train 1. Yes 2. No 3. Unknown | Code | 124. Driver 1. Drove around or thru the Gate 2. Stopped and then Proceeded 3. Did not Stop 4. Stopped on Crossing 5. Other (specify in narrative) | Code |
|---|---|---|---|---|---|---|
| 0 | | N/A | | N/A | | N/A |

| 125. Driver Passed Highway Vehicle 1. Yes 2. No 3. Unknown | Code | 126. 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 |

| Casualties to: | Killed | Injured | 127. Driver 1. Killed 2.Injured 3. Uninjured | Code | 128. Was Driver in the Vehicle? 1. Yes 2. No | Code |
|---|---|---|---|---|---|---|
| | | | | N/A | | N/A |
| 129. Highway-Rail Crossing Users | 0 | 0 | 130. Highway Vehicle Property Damage (est. dollar damage) | 0 | 131. Total Number of Highway-Rail Crossing Users (include driver) | 0 |

| 132. Locomotive Auxiliary Lights? 1. Yes 2. No | Code | 133. Locomotive Auxiliary Lights Operational? 1. Yes 2. No | Code |
|---|---|---|---|
| | N/A | | N/A |
| 134. Locomotive Headlight Illuminated? 1. Yes 2. No | Code | 135. Locomotive Audible Warning Sounded? 1. Yes 2. No | Code |
| | N/A | | N/A |

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



137. SYNOPSIS OF THE ACCIDENT

**On May 16, 2007, at 3:08 a.m. (PDT), a Union Pacific Railroad Company (UP) freight train ISEG3-15 (southbound) collided with a UP freight train IBASE-15 (northbound). The collision was a raking type collision which occurred as the northbound train was operating through a crossover from Main Track No. 1 to Main Track No. 2. The lead locomotive of the southbound train, collided into the side of the 87th multi-unit intermodal car near the rear of the northbound train. Both trains were operating on BNSF Railway Company (BNSF) owned and operated trackage.**

**As a result of the collision, four locomotives and two multi-unit intermodal cars of the southbound train derailed. The two leading locomotives went over an embankment and stopped at the edge of a nearby county road in upright positions. The two trailing locomotives derailed but remained on the railroad right-of-way in upright positions. Two multi-unit intermodal cars of the northbound train and two multi-unit intermodal cars of the southbound train derailed.**

**The accident occurred on the BNSF Northwest Division, Seattle Subdivision, Nisqually station, milepost 24.5. Nisqually is located about four miles southwest of Du Pont, Washington, and about 50 miles south of Seattle.**

**There was no hazardous material release and there were no injuries or fatalities. Damages are reported to be $2,312,626.**

**At the time of the collision, it was dark, clear, and the temperature was 45 degrees F.**

**The probable cause was failure to comply with automatic block or interlocking signal displaying a stop indication (H221). A contributing factor was the failure to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal (H605). Another contributing factor cause was reduced human performance of the southbound train crew due to fatigue.**

138. NARRATIVE

**Circumstances Prior to the Accident**

**UP Southbound train - ISEG3-15**

**A crew consisting of an engineer, student engineer, and conductor reported for duty on May 15, 2007, at 9:30 p.m., PDT. at the Union Pacific Railroad Company (UP) Argo Yard office in Seattle, Washington, following an off duty period in excess of the statutory minimum required. Seattle is the home terminal for the engineer and student engineer. Portland, Oregon, is the home terminal for the conductor.**

**The crew was assigned to operate southbound train ISEG3-15 from Seattle to Portland. The train consisted of four locomotives and 111 loaded platform/units. The train weighed 6,324 tons and was 7,574 feet in length. The train received a Class I Initial Terminal Air Test at Seattle and departed at 11:41 p.m.**

**According to the crew, the student engineer was operating the train under the supervision of the engineer at a recorded speed of about 44 mph The crew stated that they thought they were approaching Nisqually under a clear signal. However, according to signal system historical data, the intermediate signal in approach to Nisqually displayed a yellow aspect indicating be prepared to stop before passing next signal. When the train operated through a curve to the right, about 0.5 miles north of Nisqually, the absolute signal at Nisqually came into view and was displaying a red aspect indicating stop. The student engineer responded by applying the train air brake and locomotive dynamic brake systems in an effort to bring the train to a stop.**

**The railroad timetable direction of the train was south. Timetable directions are used throughout this report.**

**The student engineer was seated at the controls on the right (west) side of the locomotive. The engineer was seated on the left (east) rear chair and the conductor was seated on the left front chair.**

**In the accident area trains operate on two main tracks (Main Track No. 1 and Main Track No. 2) that are owned and operated by BNSF Railway Company (BNSF). Trains operate by signal indication of a traffic control system (TCS) that is controlled by a dispatcher located in Ft. Worth, Texas. The accident occurred at the signal control point, known as Nisqually, milepost 24.5 where there are two crossover switches between the two main tracks.**

**Approaching Nisqually from the north there is an intermediate signal, milepost 21.7 located about 2.4 miles north of Nisqually and there is an absolute signal located about 0.2 miles north of the crossover switches at Nisqually. Approaching from the north traveling south on Main Tack No. 1, starting at about milepost 23.1, there are in succession a 2-degree curve to the right about 1,521 feet in length, tangent for about 3,168 feet, a 3-degree curve to the left for about 1,028 feet to the absolute signal, then tangent for about 1,020 feet to the Nisqually crossover switches (point of collision). The grade is 0. 17-percent ascending**

**UP Northbound train - IBASE1-15**

**The engineer and conductor reported for duty May 15, 2007, at 8:00 p.m., PDT at the UP Albina Yard office in Portland following an off duty period in excess of the statutory minimum required. Seattle is the home terminal for the engineer and Portland is the home terminal for the conductor.**

**The crew was assigned to operate northbound train IBASE1-15 from Portland to Seattle. The train received a Class I Initial Terminal Air Test and departed North Portland Junction at 10:43 p.m. The train consisted of two locomotives and 98 loaded platform/units. The train weighed 6,936 tons and was 6,030 feet in length.**

**According to the crew, as the train approached Nisqually on Main Track No. 1, they observed an approach signal indicating that they would operate through the crossover from Main Track No. 1 to Main Track No. 2. The conductor announced the approach signal over the radio as required by the BNSF Northwest Division Time Table. The train received the appropriate signal indications at the absolute signal at the south end of Nisqually, milepost 24.7, and proceeded through the crossover to Main Track No. 2 at a speed of 24 mph.**

**The engineer was seated at the controls on the right (east) side of the locomotive, the conductor was seated on the left (west) side of the locomotive. The railroad timetable direction of the train was north.**

**The accident occurred on BNSF Railway Company (BNSF) owned and operated trackage. In the area of the accident, trains operate on two main tracks (Main Track No. 1 and Main Track No. 2) by signal indication of a traffic control system (TCS) that is controlled by a train dispatcher located in Ft. Worth, Texas.**

**Approaching the accident site from the south traveling north on Main Tack No. 1, starting at about milepost 25.6, there are in succession a 3-degree, 03-minute curve to the right about 2,640 feet in length, a 3-degree, 0-minute curve to the right about 1,584 feet long, then tangent for about 600 feet to the Nisqually crossover switches (point of collision). The grade is 0.17-percent descending.**

**The Accident**

**UP Southbound train - ISEG31-15**

**According to event recorder and statements from the crew, the application of the train air brake and dynamic brake systems resulted in a train speed reduction from 44 mph to 38 mph. When the student engineer realized they were not going to stop, he induced an emergency application of the train air brake system. The crew subsequently took positions on the cab floor and braced themselves for the impending collision with the northbound train that was occupying the Nisqually crossover. When the collision occurred, the train speed had been reduced to 27 mph. The lead locomotive collided into the side of the 87th multi-unit intermodal car near the rear of the northbound train. The lead and the second locomotives derailed and continued 200 hundred feet down an embankment before coming to a stop upright at the edge of the adjacent Old Pacific Highway. The third and fourth locomotives derailed and came to rest upright on the railroad right-of-way. The first car, a single unit intermodal car, and the second car, a three unit intermodal car, derailed and came to rest upright. The maximum authorized speed for freight trains is 50 mph.**

**Shortly after the locomotives came to a stop, the dispatcher contacted the crew by radio and the engineer reported the accident. The student engineer attempted to exit through the rear cab door. However, the door contacted a broken high voltage power line which created an electrical arc. The student engineer and engineer subsequently escaped from the locomotive by climbing through a side window and down a tree. They assisted the conductor in exiting the cab by prying open the front door of the cab. There were no injuries.**

**Electrical power for local residents and part of the city of Du Pont was interrupted due to the broken power line. Power was restored about two hours after the accident.**

**A Pierce County deputy sheriff arrived at the scene about twenty minutes after the collision. Fire and Hazardous Materials personnel were also dispatched to the accident scene.**

**A BNSF trainmaster from Tacoma arrived at the scene along with UP officials approximately thirty minutes after the accident.**

**UP Northbound - IBASE-15**

**The train was operating at a recorded speed of 24 mph and was in the process of crossing over from Main Track No. 1 to Main Track No. 2 at Nisqually. The crew noted that the southbound train approaching Nisqually on Main Track No. 1 appeared to be going too fast to be able to stop for before striking their train which was occupying the crossover. The engineer attempted to contact and warn the crew of the southbound train crew by radio. However, it was necessary to change radio channels. As the engineer was in the process of changing radio channels, a train line induced emergency application of the air brake system occurred and the train came to a stop. The engineer reported to the dispatcher that their train went into emergency while the conductor walked back to inspect the train. Maximum authorized speed for trains operating through the crossover is 35 mph.**

**The collision resulted in the derailment the of two multi-unit intermodal cars near the rear of train. The derailed units were in the 86th through 93rd positions. Thirteen additional cars of the northbound train sustained substantial raking damage but did not derail. There were no injuries to the northbound crew.**

**Analysis and Conclusion**

**The lead locomotive of the southbound train was equipped with a Track Image Recorder (TIR) which continuously records a video in advance of the train. The black and white TIR video clip from locomotive UP 5261 begins illustrating the area ahead of Train ISEG31-15 heading southward on BNSF Main Track No. 1 as the train was nearing the approach signal to Nisqually. Signal indications were determined by which signal on the signal mast was lighted. The video clearly and continuously depicts the approach signal to Nisqually (about 2.4 miles north of Nisqually) displaying a yellow aspect indicating be prepared to stop before passing next signal. The video then depicts the meeting of the head end of the northbound train on**

**BNSF Main Track No. 2 and the engineer turning off the headlight as the two locomotives pass each other.**

**The TIR video clip then depicts the locomotive nearing the absolute signal (located about .2 mile north of Nisqually) on BNSF Main Track No. 1 with the signal displaying a red aspect indicating stop. Approximately 16 seconds after the stop signal comes into view, the sound of the air brakes being placed into emergency can be heard on the video. As the southbound train traveled past the stop signal, the southbound train begins raking the side of the double stack container cars of the northbound train. After a brief amount of time, the impact forces of the raking collision derailed the leading locomotive of the southbound train and pushes it over the embankment where it comes to rest on the edge of the Old Pacific Highway.**

**The locomotive was equipped with a speed indicator and an event recorder as required. The event recorder data was downloaded by UP personnel at the collision site and analyzed at the Union Pacific Event Recorder Center in Omaha, Nebraska. The analysis disclosed the student engineer's train handling maneuvers prior to the collision. The FRA analysis of the event recorder data concurred with the findings of the UP analysis.**

**Analysis of the locomotive event recorder and signal system event data revealed the following:**

- **As the southbound train approached intermediate signal 21.7, it was displaying a yellow aspect. This indicated that the train should reduce speed to not more than 30 mph, and be prepared to stop at the next signal. The train was operating at a recorded speed of 44 mph, the locomotive throttle is in number seven position, and the locomotive and train air brakes were released.**

- **When the southbound train passed the signal 21.7, it was operating 45 mph, the locomotive throttle was in number 7 position, and the locomotive and train air brakes were released. At this point, the train is about 2.5 miles north of the collision site.**

- **About three minutes after the train passed signal 21.7, it was operating 44 mph and the train and locomotive air brakes were released. The train was now about one-half mile north of the collision site. The student engineer began applying the train air brakes in an attempt to stop the train.**

- **About 26 seconds after the initial air brake application and after the train had passed the red absolute signal, the student engineer induced an emergency application of the train air brakes. The train speed was 38 mph and was about one-tenth mile north of the collision site. (The absolute signal is located about 0.2 miles north of the collision site).**

- **The collision occurred at a recorded speed of 27 mph.**

**Fatigue Analysis:**

**The day before the collision, the southbound pool of UP train crews moved up three rotations. This resulted in the crew of the southbound train being called to work eight hours sooner than they expected.**

**FRA uses an overall effectiveness rate of 77.5 percent as the baseline for fatigue analysis, which is equivalent to a blood alcohol content (BAC) of 0.05. At or above this baseline, we do not consider fatigue as probable for any employee. Software sleep settings vary according to information obtained from each employee. If an employee does not provide sleep information, FRA uses the default software settings.**

**FRA obtained fatigue related information, including a 10-day work history, for 5 employees involved in this accident, including the locomotive engineer, student engineer and the conductor assigned to train 1 (southbound train), and the engineer and conductor assigned to train 2 (northbound train). Information for these five employees follows:**

**Fatigue Conclusions:**

**Train 1. Locomotive engineer assigned to train ISEG3-15 (southbound train)**
**Sleep setting -Good**
**Overall effectiveness = 71.91%**
**Lapse Index = 4.6**
**Reaction Time = 138%**
**Chronic Sleep Debt = 9.07**
**Hours of Continuous Wakefulness = 21.15**
**Time of Day=0308**
**BAC Equivalent = > 0.05**
**Conclusion: Fatigue was probable for this employee**

**Train 1. Student engineer assigned to train ISEG3-15 9 (southbound train)**
**Sleep setting -Good**
**Overall effectiveness = 70.50%**
**Lapse Index = 4.8**
**Reaction Time = 140%**
**Chronic Sleep Debt = 8.05**
**Hours of Continuous Wakefulness = 21.15**
**Time of Day=0308**
**BAC Equivalent = > 0.05**
**Conclusion: Fatigue was probable for this employee**

**Train 1. Conductor assigned to train ISEG3-15 (southbound train)**
**Sleep setting -Excellent**
**Overall effectiveness = 44.50%**
**Lapse Index = 10.0**
**Reaction Time = 220%**
**Chronic Sleep Debt = 14.39**
**Hours of Continuous Wakefulness = 15.15**
**Time of Day=0308**

**BAC Equivalent = > 0.08**
**Conclusion: Fatigue was probable for this employee**

**Train 2. Locomotive Engineer train IBASE-15 (Northbound train)**
**Sleep setting -Excellent**
**Overall effectiveness = 56.00%**
**Lapse Index = 9.2**
**Reaction Time = 177%**
**Chronic Sleep Debt = 11.06**
**Hours of Continuous Wakefulness = 15.15**
**Time of Day=0308**
**BAC Equivalent = > 0.08**
**Conclusion: Fatigue was probable for this employee**

**Train 2.Conductor train IBASE-15 (northbound train)**
**Sleep setting -Good**
**Overall effectiveness = 69.72%**
**Lapse Index = 5.1**
**Reaction Time = 142%**
**Chronic Sleep Debt = 7.05**
**Hours of Continuous Wakefulness = 21.15**
**Time of Day=0308**
**BAC Equivalent = > 0.05**
**Conclusion: Fatigue was probable for this employee**

**FRA concluded fatigue was probable for the engineer, student engineer, and conductor assigned to train 1, as well as the engineer and conductor assigned to train 2.**

**The signal system in the immediate area of the accident and recorded signal system data was inspected and examined by FRA ST&C inspectors in conjunction with BNSF and UP signal department personnel.**
**The train dispatcher's event log was also examined and was corroborated with the signal event data. Railroad officials and FRA concurred that the signal system was functioning as intended.**

**This accident met the criteria for post accident toxicological testing required by 49 CFR part 219 Subpart C as a major train accident . All members of both crews were tested. The test results were negative.**

**The BNSF timetable requires trains to change radio channels at Nisqually. Channel 87 is used from Tukwila to Nisqually and channel 66 is used from Nisqually to Vancouver Junction North. Post accident investigation revealed that both trains were complying with pertinent operating rules by operating on different channels.**

**Railroad and FRA inspectors conducted post accident mechanical inspections of both train consists. Mechanical and air brake defects were found; however, it was determined that they were not causal factors in the accident. Old Pacific Highway was closed by Pierce County for several days while crews removed the locomotive.**

**Conclusion**

**The crew of the southbound crew did not comply with the yellow aspect at the intermediate signal. The signal indication required the crew to reduce the train speed to no more than 30 mph and to be prepared to stop before passing the next signal. As a result, the train was not able to stop for the absolute signal at Nisqually or to avoid a collision with the northbound train that was occupying the Nisqually crossover.**

**UP and BNSF subscribe to the General Code of Operating Rules (GCOR). The train crew of ISEG3-15 violated the following GCOR Rules:**

**Duties of Crew Members 1.47: The conductor and the engineer are responsible for the safety and protection of their train and observance of the rules. They must ensure that their subordinates are familiar with their duties, determine the extent of their experience and knowledge of the rules, and instruct them, when necessary, on how to perform their work properly and safely. If any conditions are not covered by the rules, they must take precautions to provide protection.**

**Looking for Signals 5.2.1: To recognize and follow signals correctly, employees must:**
- **Always be on the lookout for signals.**
- **Comply with the intent of the signal.**
- **Not act on any signal that they do not understand or that may be intended for other trains or engines.**

**Where Stop Must Be Made 9.5: When movement is being made beyond a block signal requiring a train to be prepared to stop at the next signal, the stop must be made before any part of a train passes the block signal requiring the train to stop.**

**Authority to Enter CTC Limits 10.1: CTC limits are designated in the timetable. Sidings within CTC limits are controlled sidings and are governed by CTC rules. A train must not enter or occupy any track where CTC is in effect unless: A controlled signal displays a proceed indication.**

**The train crew of southbound train (ISEG3-15) also violated the following BNSF Special Instructions Number 13 dated October 29, 2006: Approach Signal 9.1.8: Proceed prepared to stop at next signal, trains exceeding 30 mph immediately reduce to that speed. (Note: Speed is 40 mph for Amtrak and Commuter trains; Metra, Metrolink, and Sounders.) and Stop Signal 9.1.15 which signals trains to stop.**

**Probable Cause & Contributing Factors**

**A contributing factor was the failure to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal (H605). Another contributing factor cause was reduced human performance of the southbound train**

**crew due to fatigue.**

**As a result of an investigation by the Federal Railroad Adminstration, the probable cause was found to be failure to comply with automatic block or interlocking signal displaying a stop indication (H221).**