



FEDERAL RAILROAD ADMINISTRATION
1200 New Jersey Avenue SE, Washington, D.C. 20590



PRELIMINARY FACTUAL FINDINGS REPORT
Derailment of Union Pacific's Unit Crude Oil Train ONETU 02
Transporting Bakken Crude Oil for U.S. Oil
Mosier, Oregon

June 23, 2016

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EXECUTIVE SUMMARY

Union Pacific/U.S. Oil Mosier, Oregon Crude Derailment

At 12:15 p.m. Pacific Daylight Time on Friday, June 3, 2016, a Union Pacific train, ONETU 02, transporting Bakken crude oil for U.S. Oil & Refining Company and operating on Union Pacific's Portland Subdivision derailed near the town of Mosier, Oregon (at milepost 69.02). A total of 16 tank cars derailed.

Train ONETU 02 was traveling at a speed of approximately 25 mph at the point of derailment. The speed restriction for this section of track is 30 mph due to the curvature of the track.

The train originated in New Town, North Dakota, and was destined for Tacoma, Washington. The train consisted of two head-end locomotives, one distributed power locomotive at the rear, two buffer cars, and 94 tank cars loaded with Bakken crude oil. The train was operating with conventional air brakes.

Dakota Plains loaded the tank cars for U.S. Oil in New Town, North Dakota. Dakota Plains reports the crude oil had a vapor pressure of 9.2 psi, measured at the loading facility.

The tank cars in train ONETU 02 were general purpose specification DOT-111 tanks cars, modified to the Association of American Railroads (AAR) CPC-1232 standard. The cars were equipped with full-height head shields and metal jackets with insulation. The cars did not have thermal protection. These cars are commonly referred to as "jacketed 1232s."

During the derailment, a coupler struck one tank car, mechanically puncturing it. This puncture allowed crude oil to come into contact with an ignition source, leading to a fire that burned for approximately 14 hours. Four cars were eventually involved in the fire.

The four tank cars involved in the fire were the punctured car, and three additional tank cars – two that had their bottom outlet valves sheared off in the derailment, and one car with the gasket melted out from under the manway cover.

FRA's Factual Findings

Cause

FRA's preliminary investigation determined the Union Pacific derailment was caused by broken lag bolts leading to wide track gauge.

FRA's investigation found that multiple lag bolts in this section of Union Pacific track were broken and sheared, leading to tie plates loosening from ties. The loosened tie plates allowed for the rails to be pushed outwards as trains moved across them, eventually resulting in an area of wide gauge, leading to the derailment.

Tank Cars

The tank cars involved in the derailment performed as expected in the incident based on tank car performance metrics.

Braking

The Union Pacific train was equipped with an air brake system and was operating on distributive power.

Following the derailment, FRA's Office of Research and Development conducted simulations modeling the derailment of Train ONETU 02, assuming the consist was equipped with conventional breaks, distributive power or electronically controlled pneumatic (ECP) brakes. (Distributive power provides power to the train from both ends of the consist and provides improved braking over air brakes. ECP brakes use an electronic trainline signal to activate brakes on all cars throughout a train consist simultaneously.)

As has been the case with previous instances of modeling, FRA's simulation found that applying the brakes uniformly and instantaneously would have provided additional train control, potentially shortening the stopping distance, and leading to a less severe derailment.

In this specific model, the simulation found that if Train ONETU 02 had been equipped with ECP brakes, two fewer tank cars may have derailed, and one less tank car may have been punctured.

Conclusion

Unless or until additional details come to light, FRA has made the preliminary determination that Union Pacific's failure to maintain its track and track equipment resulted in the derailment. Broken and sheared lag bolts, while difficult to detect by high-rail, are more detectable by walking inspection combined with indications of movement in the rail or track structure and/or uneven rail wear, and are critically important to resolve quickly.

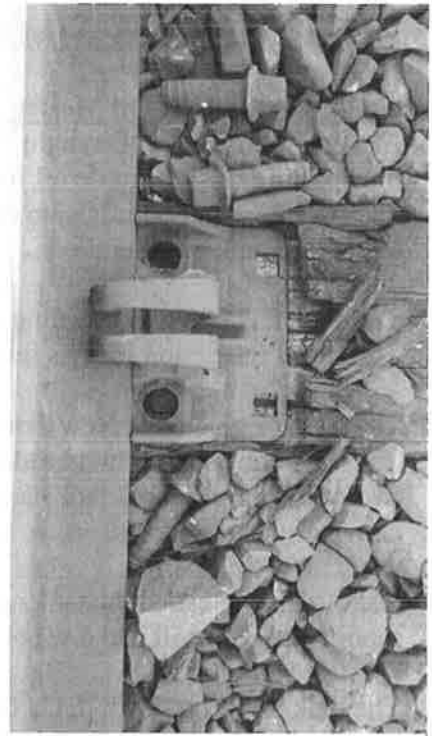


Image 1:
Image of broken bolts that allowed rails to go wide, causing wide gauge.

FRA Actions Since Derailment

Following the derailment, FRA took the following actions to inspect and ensure safety along this route:

- FRA conducted walking inspections of all the curves in the Columbia River Gorge to inspect for additional track, fastener, or bolt issues.
- FRA conducted similar inspections of BNSF track on the Washington side of the Columbia River.
- FRA conducted a data search of FRA databases for tie fastener trends across the rail industry.
- Volpe, one of the Department of Transportation's research centers, is testing the metallurgy of the broken bolts.
- Ran a geometry car with a Gage Restraint Measurement System on Union Pacific track to rule out wide gauge on Union Pacific's Portland, Ayer, and Spokane subdivisions.
- Confirmed that nine Union Pacific temporary speed restrictions remain in place along Union Pacific's Portland Subdivision, including a 10 mph speed restriction in Mosier.
- FRA is evaluating potential enforcement actions, including violations, and other actions to ensure Union Pacific's compliance with applicable safety regulations.



Federal Railroad Administration Office of Safety Analysis

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1.11 - One Year Accident/Incident Overview - Combined

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ONE YEAR ACCIDENT/INCIDENT OVERVIEW BY REGION/STATE/COUNTY

Report Type - ' CALENDAR YEAR '

SELECTION: Railroad - Union Pacific RR Co. [UP]

All Regions

State - All States County - All

January To December, 2015

Reporting Level:... INDIVIDUAL

IMPORTANT: Rates calculated on National Level do not display for Region or State Geography

' CALENDAR YEAR '

TOTAL ACCIDENTS/INCIDENTS:	1,668	Number of fatal accidents/incidents	138	8.27%
Overall frequency rate:	10.32	Total train miles:	161,620,754	
Total fatalities:	155	Switching miles:	21,752,304	
Total nonfatal conditions:	886	Employee hours:	93,094,412	

Total accidents/incidents is the sum of train accidents, highway-rail incidents, and other incidents.
Total accident/incident rate is the number of events times 1,000,000 divided by total train miles.

TOTAL TRAIN ACCIDENTS:	513	Number of fatal train accidents	1	0.19%
Number per million train miles:	3.17	Collisions:	18	3.51%
Total fatalities:	0	Derailments:	381	74.27%
Total nonfatal conditions:	18	Other accidents:	114	22.22%

-----Primary causes-----

Human factors:	29.04%	149	Track defects:	182	35.48%
Equipment defects:	17.74%	91	Signal defects:	15	2.92%
Miscellaneous causes:	14.81%	76			

Number of accidents on yard track: 302 58.87% of all train accidents.
Nbr per million yard train miles: 13.88 For other tracks: 1.51

Train accidents represent 30.76% of all reported events.

Number of train accidents involving passenger trains 0 0 %

Number of train accidents that resulted in a release of hazardous material 0 0.00% of total
Number of persons evacuated 121 Number of rail cars releasing hazmat 0

A train accident is an event involving ontrack rail equipment that results in monetary damage to the equipment and track above a certain threshold. Lading, clearing costs, environmental damage is not included.

	HIGHWAY-RAIL		TRESPASSING INCIDENTS(not at crossings)	
Crossings:	30,413	Incidents:	366	
Number per million train miles:	2.26	Frequency per million train miles:	1.03	
Total fatalities:	43	Total fatalities:	77	
Total nonfatal conditions:	132	Total nonfatal conditions:	90	
Number of fatal crossing incidents	38		10.38%	

Public Crossings 20,288 With gates 9,200 Other activated crossings 2,709 Number with passive warnings 8,379
Private crossings 10,125 ***** THE COUNT OF CROSSINGS IS THE COUNT IN THE CURRENT INVENTORY *****

Highway-rail and trespassing incidents account for 77.42% of all fatalities.
Highway-rail incidents represent 21.94% of all reported events.

A highway-rail incident is any impact between a rail and a highway user at a crossing site, regardless of severity. Includes motor vehicles and other highway/roadway/sidewalk users at both public and private crossings.

OTHER INCIDENTS:	789	Number of fatal other incidents 99	12.55% of other incidents
Other incidents account for:	47.30%	of all accidents/incidents	
Total fatalities:	112	2	Number to employees on duty. Trespassers 77
Total nonfatal conditions:	736	406	Number to employees on duty

Other incidents include any event where that caused a death, an injury, or an occupational illness to a railroad employee. Most fatalities in this category are to trespassers.

EMPLOYEES ON DUTY CASES:	439	Frequency per 200,000 hours worked:	0.94
Total fatalities:	2	1.29% of all fatalities	
Total nonfatal conditions:	437	49.32% of all nonfatal cases	



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1.11 - One Year Accident/Incident Overview - Combined

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ONE YEAR ACCIDENT/INCIDENT OVERVIEW BY REGION/STATE/COUNTY

Report Type - ' CALENDAR YEAR '

SELECTION: Railroad - ALL

All Regions

State - All States County - All

January To December, 2015

Reporting Level: ALL

IMPORTANT: Rates calculated on National Level do not display for Region or State Geography

' CALENDAR YEAR '

TOTAL ACCIDENTS/INCIDENTS:	11,600	Number of fatal accidents/incidents	720	6.21%
Overall frequency rate:	15.75	Total train miles:	736,526,467	
Total fatalities:	768	Switching miles:	91,757,614	
Total nonfatal conditions:	8,828	Employee hours:	477,710,844	

Total accidents/incidents is the sum of train accidents, highway-rail incidents, and other incidents.
Total accident/incident rate is the number of events times 1,000,000 divided by total train miles.

TOTAL TRAIN ACCIDENTS:	1,906	Number of fatal train accidents	6	0.31%
Number per million train miles:	2.59	Collisions:	148	7.76%
Total fatalities:	13	Derailments:	1,345	70.57%
Total nonfatal conditions:	539	Other accidents:	413	21.67%

-----Primary causes-----				
Human factors:	39.40%	751	Track defects:	523 27.44%
Equipment defects:	13.69%	261	Signal defects:	53 2.78%
Miscellaneous causes:	16.68%	318		

Number of accidents on yard track:	1,146	60.13% of all train accidents.
Nbr per million yard train miles:	12.49	For other tracks: 1.18

Train accidents represent 16.43% of all reported events.

Number of train accidents involving passenger trains 62 3.25%

Number of train accidents that resulted in a release of hazardous material 17 0.89% of total

Number of persons evacuated 6,866 Number of rail cars releasing hazmat 66

A train accident is an event involving ontrack rail equipment that results in monetary damage to the equipment and track above a certain threshold. Lading, clearing costs, environmental damage is not included.

HIGHWAY-RAIL		TRESPASSING INCIDENTS(not at crossings)	
Crossings: 209,444	Incidents: 2,063	Frequency per million train miles:	1.20
Number per million train miles:	2.80	Total fatalities:	465
Total fatalities:	237	Total nonfatal conditions:	416
Total nonfatal conditions:	1,003		
Number of fatal crossing incidents	210	10.18%	

Public Crossings 129,469 With gates 46,850 Other activated crossings 21,704 Number with passive warnings 60,915

Private crossings 79,975 ***** THE COUNT OF CROSSINGS IS THE COUNT IN THE CURRENT INVENTORY *****

Highway-rail and trespassing incidents account for 91.41% of all fatalities.

Highway-rail incidents represent 17.78% of all reported events.

A highway-rail incident is any impact between a rail and a highway user at a crossing site, regardless of severity. Includes motor vehicles and other highway/roadway/sidewalk users at both public and private crossings.

OTHER INCIDENTS: 7,631 Number of fatal other incidents 504 6.60% of other incidents
Other incidents account for: 65.78% of all accidents/incidents
Total fatalities: 518 9 Number to employees on duty. Trespassers 465
Total nonfatal conditions: 7,286 4,175 Number to employees on duty

Other incidents include any event where that caused a death, an injury, or an occupational illness to a railroad employee. Most fatalities in this category are to trespassers.

EMPLOYEES ON DUTY CASES:	4,343	Frequency per 200,000 hours worked:	1.82
Total fatalities:	11	1.43% of all fatalities	
Total nonfatal conditions:	4,332	49.07% of all nonfatal cases	

Passengers carried: 700,110,486 Passenger miles: 21,777,088,518
Total passenger deaths 17. Total passengers injured 1605.
The frequency of passenger cases per 100,000,000 passenger miles is 7.45 Passenger cases include all circumstances; including getting off/on standing trains, stumbling aboard trains, assaults, train accidents, crossing incidents, etc.

A passenger mile is the movement of a passenger one mile.

